ELECTRICAL REVIEW

[ILLUSTRATED]

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Hotel Fire-Alarm and Room Call.

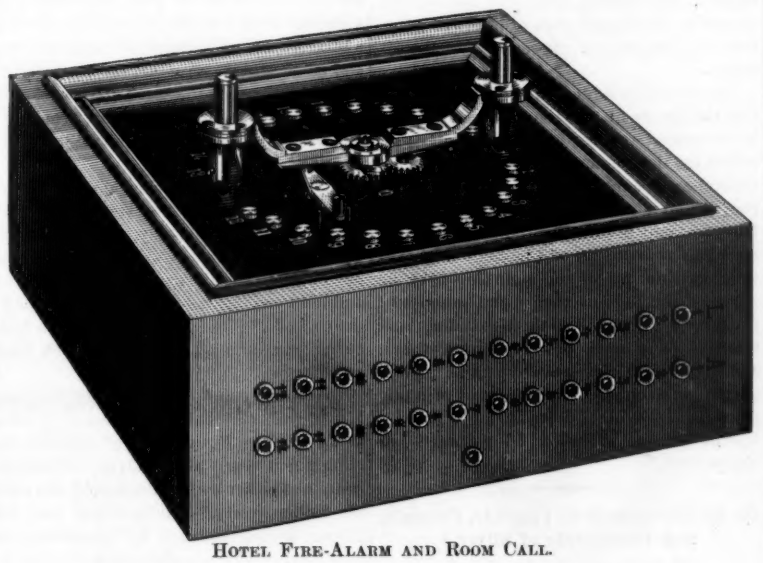
Brief mention was made in our exhibition notes last week of a piece of apparatus which holds a prominent place in the Western Electric Company's exhibit, and which is now shown for the first time. It is the Hotel Fire-Alarm and Room Call. As is well known, the hotel annunciator enables the guest to call the office and summon a servant, or even, in some cases, to call for some specific thing. It does not enable the hotel office to communicate with the guest in any way. This "long felt want" led to the invention of the piece of apparatus mentioned. It is placed in the office, and is in electrical connection with every room in the house, each room being represented by a separate button, these buttons being arranged in two concentric circles, and duly numbered. It has several uses. Does Number 57 call, causing a "drop" on the annunciator in the office to fall, the clerk presses button 57, and, by ringing a bell in that room, informs the guest that his call has been heard. If No. 57 leaves word at the office that he wishes to be called at an early hour, the clerk, instead of sending up a porter to pound on his door at the hour named, with the result of rousing everybody within sound of the blows of his sturdy fist, simply depresses the button marked 57, when the time comes, and keeps it down until the guest announces that he is both awake and up by signaling back to the annunciator, causing the bell in the office to ring and his drop to fall. Does a fire break out, the clerk turns a switch, a double-armed lever swings round the dial, mechanically depresses every button in turn, and rouses the whole household by a fire signal in every room. This, in brief, is the function of this new and ingenious device, which is so simple in its construction and operation, and so evidently needed as a measure of safety, comfort, and convenience in every large hotel, that we fully expect to see it very generally introduced.

Some Mechanical Applications of Electricity.

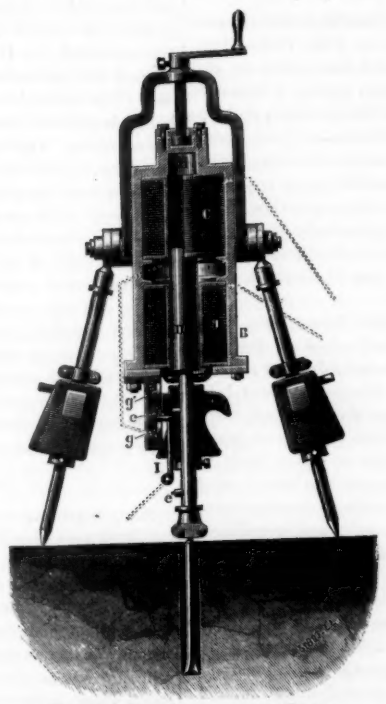
The mechanical applications of electricity are multiplying each day; they will be universal as soon as the solution of the problem of the transmission and the distribution of electrical energy shall have become really industrial. More manageable yet than conduits of gas, of air or water under pressure, the electric wires, disembarrassing the workshop of the dangerous and cumbersome equipage of transmissions of power, will allow the better utilization of space by a more rational distribution of the machines, disengaged from all accessories.

Electricity is, besides, indicated as the motor of the future—clean, economical, and without danger—for small industries.* There exist already in America some happy applications.†

The object of the present article is to show by some descriptions with what convenience electricity can be applied to the conduct of machine tools of the most diverse forms. Messrs. Stanfield and Latimer Clark have proposed a very original application of electricity for operating submarine machine tools intended to facilitate the repairing of ships.



HOTEL FIRE-ALARM AND ROOM CALL.



ELECTRICITY APPLIED TO TOOLS.

The whole apparatus is enclosed in a staunch metallic case filled with compressed air from a tube, and calculated to nearly float on the water. The drill is actuated directly by a dynamo of which armatures of the field magnets conveniently prolonged, adhere to the ship by their magnetic attraction. If the ship is of wood, one can easily replace the magnetic attraction by attachments or by vacuum-chambers like cupping-glasses.

Portable riveting machines and punches lend themselves advantageously to the application of electricity; either by the direct action of the armature, or as has been proposed by M. Tweddell (patent 1873, May 7th, 1880), indirectly by acting on the valves which distribute water under pressure.

Mr. J. Rowan, of Glasgow, has more recently constructed an apparatus in which a dynamo raises the riveting hammer by the aid of a cam on the armature, which then lets it fall and operate under the influence of spiral springs. The iron plate to be riveted is solidly maintained in position by the attraction of two electro-magnets. Commutators control the action of the dynamo and the attraction of the plate to be pierced. The mechanical applications of electricity find in the exploitation of mines a field scarcely cleared by some few efforts in mechanical traction, of separate ventilation and of signals to command the manœuvering and surveilance of the machines.

The efforts to apply electric motors to the operation of perforators have rested, for the greater part, on the rotary apparatus derived more or less from the diamond drill of Leschot. The rapidity of rotation in dynamos suits this adaptation very well; which appears to be the most simple, and in many cases the most efficacious mode of the application of electricity to perforators.

Mr. E. Ball, of Philadelphia (1880), was, on the contrary, led, like Siemens and Deprez, to the construction of his electric perforator, by the ordinary compressed air apparatus, of which so many examples exist at the present time, he has contented himself (see illustration) with replacing the action of the air on the piston by that of two solenoides C and D on an armature D^1. The two bobbins are mounted on the same frame; the wire of D ends at the contact g^1, and that of C at the contact g; they are connected to the same dynamo generator. When the parts occupy the positions indicated in the figure, the current passes from the dynamo to the earth by the bobbin C, the contact g, the movable piece or commutator I, the hook e, and the shaft of the perforator. The armature D^1, attracted by C, rises until the hook e^1 strikes I and brings it to the contact g^1. It is then the bobbin D which receives the current and causes the armature D^1 to descend, adding thus to the effect of its own weight, that of an energetic attraction. The frame B carries a dash-pot d, deadening, by the resistance of the air, the thrust of the armature D^1 when it is raised.

Among other recent applications are the electric stone cutting machines of M. Chenot and of Messrs. Bower, Pflaum & Tennet, in both of which the motor is a dynamo machine, and the only difference between them lies in the application of the power to the work to be done. Olsen's testing machine (American patent 228, 214, June, 1880), made by Fairbanks, is for testing metals, and allows, by the employment of electricity, the automatic registration of the resistance and the stretching of the samples. As long as the sample to be tested remains unbroken, the current from a dynamo maintains the belt on the motor pulley; as soon as the sample is broken, an armature ceases to be attracted and a weight removes the belt to idle pulleys and the machine stops of itself. The stretching of the sample is transmitted by a cord to a pencil which marks on the registering cylinder the curve of resistance. The machine may also be, and often is, arranged to register these results, electrically, at a distance. We are indebted to *La Lumiere Electrique* for accompanying illustration.

One of the many great objects of curiosity in the Electrical Exhibition, both to persons who have some accurate knowledge of the subject and to those most ignorant of it, are the dynamo-electric machines, of which each of the great manufacturing companies engaged in the electric light business has sent a number of specimens. A description of these interesting exhibits will be found in the REVIEW.

* For curiosity and as an analogy, we might cite the numerous applications of electricity for operating the small instruments of dental-surgery, largely developed in America, noticeably the "electric dental instruments" of Francis (American patent, 20,390—1858) Simmermann (21,853); Bonwell (209,006 and 22,851); Green (169,028, 171,123, 173,619); Spencer (175,189); Dexter (186,234); White (209,497); Paine (216,055).

† Magnetic chucks, of Oakis & Sterne (137,875), April 15, 1873. Solderers (Nos. 232,681 and 236,972).

On the Divining-Rod.

R. W. Raymond recently delivered an interesting lecture on above subject which we give briefly herewith:

After an introductory allusion to the prevalence, even at the present day and in this country, of a belief in the divining-rod as a means of discovering springs, mineral veins, hidden treasures and oil deposits, the lecturer described its various forms, the commonest of which resembles a letter Y, and consists of a forked branch of witch-hazel having this form. Other materials and other shapes have been recommended from time to time. The ordinary forked rod is held in the two hands, each grasping the extremity of a prong, with the fingers closed and the palms upward, the shank or stem being horizontal or vertical or variously inclined, according to the preference of the operator. Carried in this manner over the surface, the rod is said to turn or dip over or near treasure, veins, springs, etc., and even to give more complicated information by means of its movements, which have been at different times elaborately codified. Unfortunately, the rules for preparing, using and interpreting the rod, given by different experts and authors, are very contradictory.

The lecturer proceeded to trace the mythical origin of the divining-rod and its use in ancient times—principally, if not wholly, for moral purposes; that is, for the discovery of guilt or the decision of important questions, or the indication of future events. Its physical application, for the discovery of hidden springs, metals, etc., seems to have been of later origin, and to have become general throughout Europe in the sixteenth century. During this period its action was either attributed to a mysterious natural affinity between the material of the rod and the material affecting it, or else to the agency of evil spirits, or to a divine gift bestowed on the operator. Even at that time, however, there were those who pronounced the practice to be a delusion and superstition.

The case of the Baron and Baroness Beausoleil, who, after great expenditures and meritorious achievements in developing the mineral resources of France, were finally, as the result of hostile machinations, imprisoned by Richelieu as sorcerers, and who died about 1645 in prison, illustrates both the superstition and corruption of that period. The Province of Dauphiny, where these martyrs probably introduced the use of the divining-rod, became subsequently famous for its *hommes à baguette* or diviners, who were employed to find springs, treasure, etc., and also to detect criminals and to restore lost landmarks in cases of boundary disputes. One of them, Jacques Aymar, became in 1692 the hero of a famous murder case, following the criminals for miles, and at last indicating one of them, who confessed the deed and was executed. This made a great sensation. Aymar was called to Paris, and, after many experiments, was discredited as an expert, but not without having gained many advocates and believers. At this numerous treatises were written, both as to the facts and as to the theory of the rod—the latter being referred, in accordance with the dominant Cartesian philosophy, to "corpuscular effluvia." According to this school, there were "corpuscules" of springs, minerals, thieves, assassins, lost landmarks, etc.—each kind exerting a different influence upon the sensitive expert, and possessed extraordinary levity and permanence, so that they could be traced, suspended in the air, after the lapse of days or years. The literature of the subject is voluminous, and it is not safe to take either facts or explanations from any single work—as has often been done by later writers—because there is sure to be another treatise contradicting both.

Aymar and his followers having attempted to divine the character of individuals and otherwise encroached upon the province of the Church, these uses, at least, of the divining-rod were generally denounced by the clergy, and in 1701 condemned by the Inquisition. But the physical uses still found adherents; and in the eighteenth century the discoveries of Galvani furnished the basis for a new scientific theory—the electrical theory—of the rod. Another diviner from Dauphiny, Bartholemy Bleton (born 1750), was the great expert, and found his *savant* in Dr. Thouvenel, who wrote a famous book about him. The theory of Thouvenel has recently been re-discovered and propounded as new by Mr. Chas. Latimer, of Cleveland, who published, a few years ago, an essay on the divining-rod, in which he is a firm believer. The electrical theory, however, was thoroughly refuted in 1782, in the case of Bleton, by the simple expedient of making and destroying the insulation of the operator *without his knowledge*, and thus proving that such knowledge was an essential part of the so-called electrical action.

Numerous other "hydroscopes," or water diviners arose; and the discussion of the subject was active down to the earlier part of this century. The accepted explanation of such of the phenomena as are not due to conscious deception (the temptation to which is, of course, strong and constant), was given by Chevreul in 1833, and repeated by the same investigator in his work *De la Baguette Divinatoire*, etc., published in 1854. This is a report to the Academy of Sciences. Chevreul ascribes the motion of the rod to minute, unconscious muscular movements, caused by the imagination or intuitive or unconscious decision or expectation of the operator.

The lecturer adopted with some modification the theory of Chevreul, suggesting that, in the case of springs (and of mineral veins, which are the conduits of springs), there are differences of temperature, heat-conductivity, etc., which might affect sensitive persons so that the unconscious volition and minute muscular movements of Chevreul might be thus occasioned. In the main, however, he regarded the present theory and practice of divining with the rod as the small, lingering remnant of a once powerful superstition, and entitled to the same respect as "planchette"—the object of curiosity, or of study from the standpoint of psychology, but not worthy of the attention of geologists or prospectors.

On the Electrolysis of Fluoride, Chlorate, and Perchlorate of Silver.*

By G. Gore, LL.D., F.R.S.

By means of pure dilute hydrofluoric acid (prepared as described in Phil. Trans., Roy Soc., 1869, p. 196), and pure oxide or carbonate of silver, a rather strong solution of pure argentic fluoride was obtained, and was then acidified by addition of pure hydrofluoric acid in order to fit it for electrolysis.

This liquid is a remarkably good conductor of electricity, and is decomposed with the greatest ease by employing electrodes of silver and an electric current derived from a single cell composed of zinc and platinum in dilute sulphuric acid.

I have elsewhere (Phil. Trans., Roy. Soc., 1870, p. 235) described some of the phenomena attending the electrolysis of a strong aqueous solution of this salt not containing any free acid, such as the extremely rapid formation of a very thick coating of beautiful and bright crystals of silver upon the cathode, soon becoming half an inch in thickness and rapidly extending over the bottom of the vessel to the anode, and metallically uniting the electrodes unless the deposit is frequently removed. The increase of these crystals is so rapid, with a strong solution and current, that if the vessel is a small one it soon becomes half filled with them.

There is, however, another phenomenon to which I now desire to call attention, viz., that whilst a thick and smooth anode of pure sheet silver, in a suitable solution of potassic cyanide, dissolves gradually away, and retains its original whiteness, cohesive strength, and most of its original smoothness, until it has become extremely thin, a similar anode in the fluoride solution quickly becomes exceedingly rough, of a grey aspect, and very friable throughout its thickness, having lost its original degree of cohesive strength.

* Paper read before the Birmingham Philosophical Society, June, 1884.

Imagining that this loss of cohesion might be due to some substance set free by electrolysis and absorbed by the silver, as in similar cases of absorption of hydrogen and other liberated ions at metallic cathodes, I took a tube of pure silver, 2½ in. deep, ⅜ in. diameter and about 1 mm. thick, closed at the bottom by pure silver, and employed it as the anode, the upper end of the cup being tightly closed by cork, through which was fixed a slender platinum tube connected by an india rubber tube, with an open, slender and bent glass tube containing mercury, in order to render manifest any diffusion of gas into the interior of the tube.

Under these conditions, the liquid was electrolyzed until a large hole was corroded in the tube; no signs of gas or odor, however, appeared, nor was the cork which closed the tube bleached or blackened. I conclude, therefore, that the loss of cohesion of the silver was not due to diffusion of liberated fluorine through the silver.

A solution of chlorate of silver was formed by adding to 1¼ oz. of aqueous chloric acid (containing as impurity traces only of hydrochloric acid or a chloride) 10 grains of argentic oxide; it nearly all dissolved. The liquid was filtered and then electrolyzed by means of electrodes of pure sheet silver, and a current from two Smee's cells charged with a mixture of one volume of sulphuric acid and 50 of water. Conduction was very free for a short time; the anode, however, soon became coated with a black film, probably of peroxide of silver, which appeared to stop the current.

Silver was freely deposited at first. The deposit was loose, and not very white. The anode corroded but slowly, and permanently continued nearly black. By employing one Smee's cell only, the deposit was more slow and more coherent, and remained attached to the cathode. The solution requires a feeble current, a large cathode and much larger anode.

To form the solution of argentic perchlorate, fifteen grains of oxide of silver were added to one ounce by measure of aqueous perchlorate; it nearly all dissolved. The liquid contained either hydrochloric acid or a chlorate rather freely. The solution was then filtered and electrolyzed by means of a current from two Smee's elements feebly charged and electrodes of pure sheet silver; copious conduction occurred. The anode quickly became black, as if peroxide of silver was formed, but the current did not much diminish. The cathode soon acquired a very bulky deposit of loosely adherent silky crystals of silver. The liquid was again filtered, and then diluted with half an ounce of water, and a current from only one Smee's cell now employed. The anode became less dark in color, the conduction was still very free, and a smaller bulk of crystals was deposited. A wire of silver was now substituted as the anode, and the crystals removed. The anode rapidly corroded, and acquired a thick, loose coating of black matter, which kept falling off; it then acquired a thick, green coating, but evolved no gas. The solution is a remarkably good conductor. It requires a very large cathode, and a rather small anode.

Many ingenious applications of electricity are shown by the Novelty Company at the Philadelphia Exhibition. A boat four inches long, containing its own battery power, will run at fair speed for forty minutes, and costs $15, while a locomotive which gets its electric power by connection with the brass rails will run indefinitely, and costs $25. A machine shop, with electric forging hammers, planers, etc., and a full outfit of vertical and horizontal engines, completes a partial list of the toys. Among the more practical applications are an electric engine tell-tale, by which the steamer pilot knows at a glance the position of all the levers in the engine-room, and gas-burners which can be lighted or turned out singly or all together, by touching push-buttons placed in various parts of the house. A pendant to each burner will, by a pawl attachment, turn on and light the jet if it is not lighted, or, if already in use, will, by the same downward motion, turn the gas off. A hand gas-lighter, to replace the present clumsy wax-taper, contains in a small space an induction coil and battery to furnish the spark, and is said to work satisfactorily. An improved burglar alarm is also shown which rings a bell in the servants' rooms at any hour, and at the same time turns off the alarm from any desired portion of the house, leaving the remainder still protected. The Telemeter Company has on exhibition various instruments to record continuously the temperature of any confined space, and to give warning by ringing a bell whenever the temperature passes a given point by a degree or more in either direction. One modification of this instrument registers the steam pressures in boilers, and a second records the pressure on city water mains. Such an instrument placed in the condenser pipe of an ocean steamer will predict the approach of icebergs.

The B. and O. Raises $2,000,000 to be Applied to Extensions.

It is announced that the Baltimore and Ohio Telegraph has determined to press very vigorously and with immediate activity in opposition to the Western Union. Arrangements have been made for extensions from Baltimore to Norfolk, Richmond, Charleston, Savannah and Atlanta, and from Chicago to St. Paul and Kansas City. President Bates states that these extensions will probably involve an outlay of not far from $1,000,000, and that twice that amount has been raised within the last few days to be applied for the development of the system, and the extension of its lines. The remaining million of dollars will be employed in extensions in other directions. The Baltimore and Ohio's recently completed lines to Boston, Providence, Newport, etc., etc., were opened on Monday last, and are reported to be doing a considerable business. In the Southwest, though, the efforts of the Baltimore and Ohio to reach out telegraphically have been met by a decided opposition, foremost in which is, very naturally, Jay Gould, as representative of the Texas Pacific Railroad Company and the Western Union. These two corporations are making a bitter fight in Texas particularly, and are seeking through the courts to prevent the Baltimore and Ohio's lines from being run along the Texas Pacific Road, from Texarkana to Sherman, a distance of about 155 miles. It is reported in New York that the real use for the extra million of dollars referred to above is the purchase of a controlling interest in the crippled Bankers and Merchants' Company. Its financial embarrassments have not been relieved. Default was made on Monday on $3,000,000 six per cent. bonds of the American Rapid Telegraph Company, assumed by the Bankers and Merchants', which also holds a majority of the American Rapid's stock, but foreclosure proceedings cannot be begun for six months.

The line of the Bankers and Merchants' Telegraph Company, from New York to Philadelphia, is bonded for $290,000. It owns a majority of the stock of the Rapid and the Southern, and a majority of Rapid bonds. The Baltimore and Ohio owns 4,700 shares out of 9,200 shares outstanding of Commercial Telegraph Company's stock.

Rights of Telegraph Companies.

IMPORTANT CASE BEFORE THE DISTRICT COURT OF BRISTOL COUNTY—DECISION BY JUDGE FOX.

An important decision to telegraph companies, concerning their rights on the highways, under the laws of Massachusetts, was decided in the district court of Bristol County, holden at the city of Taunton, on Monday last. The City Marshal of Taunton brought a civil suit against an employe of the Baltimore and Ohio Telegraph Company for injuring and defacing certain trees standing in a public street, contrary to the form of the statutes of the Commonwealth and the ordinances of the city. The prosecution was represented by Judge Fuller of Taunton, who argued that under the statutes of the State a tree in the highway was the property of the abutting owner, and no one could cut

it down or deface it without a hearing before the Board of Aldermen, after 30 days' notice to the abutter; that in the case of White *vs.* Godfrey, 97, Massachusetts Reports, 472, the court had stated that not even a city official could cut a tree without due process of law and notice. Judge Fuller produced evidence going to show that neither the city officers nor the Baltimore & Ohio Telegraph Company had given any notice or paid any attention to the protests of the abutters in regard to the trees shown to have been damaged in Taunton.

Mr. Parker C. Chandler, of Boston, counsel of the Baltimore & Ohio Telegraph Company, argued that, under the United States statutes at large—title lxv., sect. 5263, and title lxvi.—all telegraph companies have the right to construct, maintain and operate lines of telegraph through, over and along any post roads of the United States, so as not to interfere with the ordinary travel on such roads. The statute defines as post roads all letter carrier routes established in any city or town for the collection or delivery of mail matter. The streets of Taunton, he urged, are post roads, hence, under the federal laws, the telegraph company had a right to be in the streets. Under the statutes of the Commonwealth, it is stated that selectmen and aldermen must grant a location to a telegraph company when it applies for one, and the telegraph company must construct and maintain it as directed by these officials; these officials can change the location, but not without granting a new one. Mr. Chandler argued that in the very recent case of Pierce *vs.* Drew, not yet reported, Judge Devens decided that the owner of the fee in a highway cannot recover damages on account of the erection of telegraph posts; that when the public took the highway it had it for all highway purposes known at the time, or subsequently found to be needful to the highest public use; that the telegraph companies acquired no right as against the owner of the fee by its enjoyment, nor is there any presumption of a grant raised; the telegraph company is only given the right to use the land by permission of the municipal authorities, who have it in charge for public uses. When the land was taken for a highway, that which was taken was not merely the privilege of traveling over it in the then known vehicles, or of using it in the then known methods, for either the conveyance of property or transmission of intelligence.

The discovery of the telegraph developed a new and valuable mode of communicating intelligence. The use was similar to, if not identical with, the public use of transmitting information for which the highway was originally taken, even if the means adopted are quite different from the post-boy or the mail-coach. It is a newly-discovered method of exercising the old public easement, and all appropriate methods must have been deemed to have been paid for when the road was laid out. Under the clause to regulate commerce among the States, conferred on Congress by the Constitution of the United States, although telegraphic communication was unknown when it was adopted, it has been held—Pensacola Tel. Co. *vs.* Western Union Tel. Co., 96 U. S. 1—that it is the right of Congress to prevent the obstruction of telegraphic communication by hostile State legislation, as it has become an indispensable means of inter-communication. Judge Fox rendered the following decision:

In the disposal of this case, I find the questions involved are not very complicated. There is no doubt that Mr. Tarr is the foreman of the construction gang, and that the trees were cut under his direction, and that the trees were marred and injured very much; so that, unless he did this under sufficient excuse and authority, he might be held liable. There is no doubt that the company has the right to run the lines through our streets; the Board of Aldermen has granted it this right, and furthermore fixed the exact location of every pole and its height, and the company has apparently run its wires according to instructions. There may be a difference of opinion as to whether these trees were cut in an unreasonable manner, but the evidence does not satisfy me that the trees have been cut in any unreasonable manner, so that the single question is, whether, when the company gets permission to run its wires and cut the trees, it is liable under the city ordinances or the public statutes. The statutes say punishment shall follow when there is "wanton destruction," and there is no wanton destruction in this case. The city ordinances do not go so far. The aldermen have fixed the line for this company, and, if it is found impossible to run such line without cutting trees, then the trees must be cut. There is no criminal complaint made out, and Mr. Tarr is ordered discharged.

Automatic Fire Extinction.

The fire risk—always serious—rather increases than diminishes in all countries in these days, and numerous as are the appliances for preventing or putting out fires, we yet find every year that the loss to the community by fire in property alone, to say nothing of life, is lamentably great.

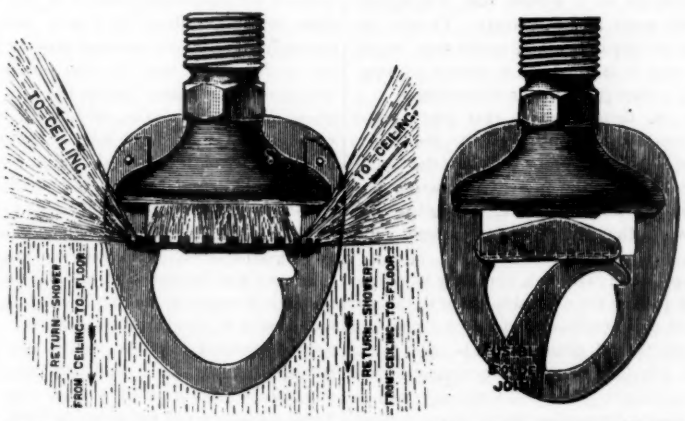
In one great industry alone in this country—that of flour milling—insurance is virtually in abeyance, so great has the risk grown to be, and it has long been obvious that very special measures are necessary to insure a reasonable amount of security against loss by fire, which has grown to so be very common and great.

As will be seen, we now give an illustrated description of an invention for automatically extinguishing fires, which appears to us to possess very conspicuous merits indeed, and to be virtually a perfect arrangement for fully carrying into effect the purpose in view. The special aim of the invention we here refer to, known as the "Grinnell" sensitive automatic fire extinguisher and fire alarm, is, in a word, to arrest a fire in the earliest stage of its existence, through the agency of the heat of the fire itself. It is thus perfectly automatic, as it requires no human intelligence or agency to operate it. As to the general arrangement of the system, lines of small pipes are carried through the building, near the ceilings, and from eight to ten feet apart; and these are all connected with a larger pipe leading from the public water main, a tank at an elevation, or any source of supply that will keep the water in the pipes under pressure. To each of the suspended lines of pipe, and ten to twelve feet apart, the automatic extinguishers hereafter described are attached. Each extinguisher, therefore, covers and protects about one hundred square feet of surface, both of floor and ceiling. The extinguishers being not over eight or twelve feet apart, a fire cannot occur more than seven feet from four of them, and may be within four feet of two of them. Should a fire start at any point, the heat at once rises to the ceiling, where the temperature is very soon raised sufficient to melt the fusible solder which secures the valve of the automatic extinguisher; the valve is then released, and the water, which is under pressure in the pipes, is profusely distributed on the fire. The arrangement of the piping can be readily modified to suit buildings of different plans of construction.

The action of the extinguishers will be easily understood from our illustrations. As will be seen, one of the engravings shows the extinguisher closed and water-tight, and the other represents it open and in full action. A thin metallic diaphragm, capable of yielding to internal pressure, forms the bottom side of the extinguisher body. In the center of the diaphragm is an opening, half an inch diameter, through which the water is discharged. Round the opening is a raised ring or valve seat, formed on the diaphragm. The valve or cover closing this opening is a disc of soft metal held in a circular brass plate, having a toothed edge and a deflector, or means whereby the stream of water issuing from the opening is cut up into spray and distributed generally on ceiling and floor. The soft metal disc or valve proper is held against the seat rings on the diaphragm by a pair of compound levers, one of which bears centrally on the deflector holding the disc. Both levers fulcrum on a thin brass yoke, one-sixteenth of an inch thick, secured to the body of the extinguisher, and the long arm of the second lever is secured to the yoke by the fusible solder. When the extinguisher is closed the water pressure on the yielding diaphragm forces the seat ring against the soft metal disc or valve, and thus the greater the pressure the closer will be the contact; there can never be any leakage.

As to the operation, as soon as the heat of a fire breaking out softens the solder joint between the second lever and the yoke, the diaphragm with its valve seat and the valve move together a sufficient distance to completely sever the solder joint before any water can escape to cool it. The levers are thrown from the yoke; the deflector, with the valve, is forced from the opening to the notches which formed the fulcrums that held the levers, and the deflector is then in position to distribute the escaping water, as shown in one of the cuts. Thence it appears that this device embodies a valve which is held closed and forced open by the same pressure, and that it moves before it opens. As to its sensitiveness to heat, there is no question as to how soon after a fire starts it ought to be put out, and it is certain that the damage likely to be done increases in a very rapid ratio in proportion to the time it burns. Thus, for example, a shaving of the solder melts at 155° Fahr. The extinguisher being placed alongside will operate, in a gradually increasing temperature in ten or fifteen seconds afterward. This shows very forcibly the advantage of the sensitive extinguisher, not only to apply water more quickly at the point where the fire starts, but to overreach and cut off a fire which is spreading rapidly in a small quantity of light material. For drying stoves the solder can be made to melt at any higher temperature up to 212°.

The following are among the advantages claimed: 1st. It is always in readiness to act at whatever hour of the day or night a fire may occur. 2d. It is not dependent for its efficiency upon the intelligence, faithfulness, coolness, or even the presence of the watchman or other attendants. It is absolutely automatic in its action. 3d. It is prompt to act because of its extreme sensitiveness to the heat. 4th. It can be relied upon to do efficient work in a room so charged with stifling smoke that no human being could remain there. 5th. It will confine the fire within a few feet of the spot where it originated. 6th. It will discharge water only in the immediate vicinity of the fire which operates it, and therefore all unnecessary damage by water is avoided. 7th. Having an open outlet, its efficiency can never be destroyed or impaired by becoming clogged with lead, rust, or other substances. 8th. If a fire starts and is not discovered, it not only promptly attacks the exact point of danger, but gives the alarm to the watchman, who will then be in readiness to shut off the water as soon as the fire is extinguished. 9th. In severe weather, when it may be necessary to shut off the water from the pipes to avoid freezing, if a fire starts this apparatus will turn the water into the pipes again by the same movement which opens every one of the extinguishers for use.—*Invention.*



THE GRINNELL EXTINGUISHER IN OPERATION. THE EXTINGUISHER CLOSED.

⁂ In the East Indies, telephone work is going on steadily, and the number of subscribers at each of the centers is on the steady increase. In Calcutta, Bombay, and Madras the police and fire stations have had systems put in for them, which work to every one's satisfaction.

Talking of a Time when Electricity will be the Great Motive Force.

"I am convinced that before many years we shall have ships supplied with dynamos and motors riding across the Atlantic, generating their own electric current from coal," said Edward Weston, the electrician and inventor.

"Can you give me an idea of the action of a dynamo?" inquired a reporter.

"If you have a mind to write a book, yes. The subject entails a history. But, briefly, it is two magnets, one revolving within the field of power of the other. It has been found that a magnet once charged retains its magnetism for a considerable period. It also has the power of giving a certain portion of this magnetism to a good conductor when brought within a certain range or field, thus converting the conductor into another magnet. This second magnet, of course, has the same power of giving out magnetism. Therefore, by joining the ends of the copper wires which are wound around each of these magnets, we confine the current produced to themselves, thus forming what is called a mutual accumulator—the second magnet adding to the supply of the first, the first increasing that of the second, and so on until, if there were no means of taking some of this magnetism or electricity away; the heat produced would be so great that the instrument would be consumed. Therefore, a third series of wires is attached to those wound around the first magnet and carried to the distributing ends wound around the armature. This last pair of wires are those from which we take our current for use."

"Is there any arrangement by which electric lights can be regulated—that is, made low or high at will?"

"Yes. The rheostat. This is an instrument attached to the resistance coil, by which we can, by turning a handle, regulate the current supplied to the lamp, but it does not interfere with the amount of current generated. However, the electric light is not like gas. The reason for lowering gas is either for economy's sake or else to save relighting or looking for a match. Now, there is no match required for electric lights; all you have to do is to turn a key and the carbon is ignited. Look at the advantages of this electricity. Why, you can have it so arranged that if a burglar opens a door or a window, breaks a pane or cuts a panel, every light in the house is instantly lit. Or you can have, as I have at my own house, a key at your bed-side, and instantly turn on every light if you should have an unwelcome guest."

"Your house probably is completely arranged with electrical apparatus?"

"Not so fully as I should wish. I shal not be satisfied till I can open and close every door and window, chop my meat and cook it, grind my coffee, and do a great many other useful things about the house short of eating and sleeping by this means. I am perfectly certain in my own mind that a very few years will see electricity the great motive, lighting and working agent of the world."

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We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, SEPTEMBER 27, 1884.

CONTENTS.

	PAGE.
Hotel Fire-alarm and Room Call	1
Some Mechanical Applications of Electricity	1
On the Divining Rod	2
On the Electrolysis of Fluoride, Chlorate, and Perchlorate of Silver	2
B. and O. Raises Money for Extensions	2
Rights of Telegraph Companies	2
Automatic Fire Extinction	3
Talking of Time When Electricity Will be the Great Motive Force	3
Editorial Notes	4
The Bell-Drawbaugh Suit	4
After the Decision—What?	4
A False and Malicious Charge	4
Electrical Induction in Underground Conductors	4
Notes of the Exhibition	5
Telephonic News	6
Telephony in South Australia	6
Telegraphic	7
Electrical and Scientific	8
The Gerard Incandescent Lamps and Dynamos	9
Electric Light News	9
Electrical Patents	10

THE BELL-DRAWBAUGH SUIT.

The REVIEW has had but little to say concerning the long-pending suit which this week reached a hearing, because it has felt that trial by newspaper was and is of but little avail, and that it is an act of presumption for any one, whatever his profession, to pretend to have an opinion worth giving until he has at least examined the evidence. In this case the sworn testimony covers over seven thousand printed pages, and is so intricate and voluminous that, were it at one's disposal, at least a month of hard reading and harder thinking would be required to master it. Nor is this all. An important part of the evidence is in the form of "exhibits," models in various stages of perfection, an examination and complete understanding of which is necessary before any one can have or express an intelligent opinion. This mass of evidence, these exhibits, and the lengthy arguments of able and learned counsel on both sides, are what are now being laid before Judge Wallace, and it is upon these, after mature and careful deliberation, that his decision is to be rendered.

In the meantime, let us inquire into the exact status of the case, as a matter of information. The People's Telephone Company, owning whatever rights Daniel Drawbaugh may be adjudged to have in connection with telephones, is, and for several years has been, under a temporary injunction, obtained at the instance of the Bell Company, restraining it from operating telephones. Application being made to have this injunction made perpetual, the People's Telephone Company was called upon to show cause why it should not be done, and out of this grew the taking of the great mass of evidence now before the court. In this suit the Bell Company appears as plaintiff and the People's Company as defendant, and such vast interests hang upon the result that each side has thought it wise to employ the most able counsel to be found, and that the public take such interest in the case. It is understood that the hearing will occupy two weeks, and possibly three; and how long it will be after the arguments have all been made before the decision of the judge may be expected, it is impossible to even guess. It is not supposable that it will be delivered in much less than sixty days after the hearing closes, and it is not at all impossible that it may not be rendered for six months.

AFTER THE DECISION—WHAT?

While it is not possible to guess with any degree of, or approach to, certainty what the decision in the pending telephone suit—probably the most important patent cause ever heard in this country—may be, it is not out of place to consider what the immediate and ultimate effect of the decision is likely to be, according as it turns out to be one way or the other.

The People's Company is just now the "under dog"—that is, it is under injunction; it may neither manufacture nor use telephones; it has no patent. On the other hand, the Bell Company has patents; it manufactures telephones, and uses them to an extent which brings to it rentals that pile up into princely sums in its treasury. Clearly, the People's Company is the "under dog" in the fight, and is entitled, as a matter of sympathy, to first place in our discussion.

Let us, then, suppose that the "under dog" comes out on top; that the decision is against the Bell Company; that the judge refuses to make the present injunction perpetual, and that, therefore, it is dissolved; in a word, that the People's Company wins. What is then the status?

Simply this: The Bell Company would no longer possess the exclusive claim to the art. The *art*, practically—certainly for a time and probably for all time—would be open to the world, provided no patents covering devices were infringed. The Bell Company, and its subordinate companies, would continue business, using their plant, their devices founded on hundreds of patents which they own, and their immense and intricate organization. The People's Company, in common with everybody else, would have a perfect right to practice the art, but they would have no exclusive privilege. It is claimed that, were they to show priority of invention, they could get no patent, because of the two years' clause in the patent law; but this, they allege, is not the fact. It is very certain that the People's Company have looked upon it as a possible fact, for they have over and over again said that, failing to obtain a patent from the Patent Office, they would appeal to Congress. And there are very many evidences of their decided intention to appeal to Congress in the event of a decision unfavorable to them. Their appeal would be for a patent. What their chances would be of getting a patent on what had already become, by the operation of the decision, the common property of all, we leave it to the reader to estimate. But, in the remote possibility of the granting by Congress of such a patent as the People's Company claims, the Bell Company would be in the position of an infringer. So much for the first supposition.

Now, let us suppose that the Bell Company wins. The story will be a very short one. The stock of the People's Company, and of the half-dozen subordinate companies which have been organized under it, would not be worth the paper it is printed on, for it would be under perpetual injunction, with the right, of course, to appeal to the Supreme Court. But the Supreme Court is far removed, so far as time is concerned, and every day of delay would make the Bell Company just so much stronger.

Practically, then, a decision in the Bell Company's favor would kill the People's Company, while the worst that a contrary decision could do would be to cripple the Bell Company by taking away its monopoly. Not until a patent had been granted by the Patent Office and few believe that the Patent Office would grant one under the law as it stands—or by Congress, which is still more improbable, can the business of the Bell Telephone Company, or its licensees, be interfered with by process of law.

The question has been asked why this suit has not been compromised, instead of spending so much money and time in the courts. There may be many good reasons, but one is sufficient. *It could not, from its very nature, be compromised.* If Drawbaugh did invent the telephone prior to Bell, he failed to patent it within two years, he *abandoned* it, gave it to the public, and neither he nor any one else can enter into a compromise that will give it to the Bell Company. So long as the question of priority of invention remains open, any one may set up the abandoned invention of Drawbaugh as a reason why the Bell patents on the art should be disregarded. The object of this suit is to find out whether Drawbaugh made the invention which he abandoned, before Bell made the invention which he patented.

A FALSE AND MALICIOUS CHARGE.

The following telegram from St. Paul, Minn., appeared on Wednesday of this week in the New York *Times*, the New York *Tribune*, and the Boston *Herald*:

"Investigations concerning the management of the telephone business of the State show a bad condition of affairs, and have seriously compromised several persons holding positions of trust in the companies. The latest development is that the Erie Telephone and Telegraph Co., of Lowell, Mass., who has, it is said, been heavily defrauded by one of its highest officials, L. N. Downs, a stockholder and General Manager of the whole system with headquarters at Lowell, is charged with defrauding the company out of $40,000 in 1883. The Dakota Telephone Company was bought, through Downs, for the Erie Company, he paying for it, with the consent of the Directors, $70,000. It is now discovered that he really gave but $30,000 for the line, and the remaining $40,000 he appropriated to his own use. This transaction did not come to light until the past week In August Downs left Lowell for a trip to Europe, and his whereabouts are unknown. It is believed he expected detection sooner or later, and has remained away beyond the time when he said he should return. C. J. Jones, of St. Paul, former manager of the Southern District, was subordinate to Mr. Downs, and knows something of the transaction, but he says he cannot at present disclose anything in justice to the officials of the Erie Company. Among the various local obliquities it is found that the local managers extracted a bonus of $600 from the people of White Bear in consideration of the introduction of the system in that village, and the money was never turned over to the company's treasurer at Lowell. Jones says that he knows the essential facts of the whole affair. He had the management of the Dakota Telephone Exchanges, and he aided in making the purchases."

To the great majority of our readers it is probably unnecessary to say that there is not a word of truth in the above. What could have induced anyone to concoct such a series of lies we cannot imagine. Fortunately, everything connected with the purchase of the Dakota Company's territory by the Erie Company is a matter of record on the books of both companies, and these show that the purchase was not made by Mr. Downs, but by the Executive Committee; that the full sum was paid to the Dakota Company, *and divided among its stockholders.* Further, while it is true that Mr. Downs made a trip to Europe this summer, being absent just twenty-four days, it is also true that he is, and, ever since his return four or five weeks ago, has been attending to his regular business; that he is a large stockholder and prominent director in the Erie Company, attending all meetings; that he attended the telephone Convention in Philadelphia, and, what is more important, that he is just now bending his energies to discover who it is that has perpetrated this outrage, and when found we do not think any punishment which may be inflicted can be severe enough to cover such a contemptible and dastardly crime. There will be more to be said about this matter as time goes on.

Electrical Induction in Underground Conductors.

At a recent meeting, says the *Montreal Shareholder*, of the Royal Society at Ottawa, Mr. F. N. Gisborne, superintendent of the Government telegraph service, read a paper on electrical induction in underground and aerial conductors. A number of diagrams were presented illustrating the conditions obtaining in neighboring circuits, and two or more circuits arranged as ordinarily, and arranged according to his method, were compared. The advantages of the latter arrangement were clearly set forth, and proofs of its efficiency were presented in a tabulated statement of experiments made with a section of cable constructed under his direction and laid underground, between two of the departmental buildings here. The cables are over 3,000 feet in length, and contain twenty insulated conductors or wires—in all, over twenty-seven miles of insulated wire—which are divided into pairs, two conductors being twisted together in each case; each pair constitutes a metallic circuit—that is, one conductor is used as a "return," instead of earth-plates being utilized for this purpose, as is usually done. The peculiarity of Mr. Gisborne's invention consists in the twisting of these metallic circuit conductors, as both wires are thus made to occupy an equidistant relationship with respect to any other conductor or pair of conductors in their vicinity. Strictly speaking, Mr. Gisborne's system is one in which induced currents are not created, rather than one by which the evil effects of induced currents are neutralized. In the discussion which followed the reading of the paper, it transpired that if a conductor were inclosed and insulated within another conductor (such, for instance, as a gutta-percha covered wire drawn through a metal tube), and both conductors were connected with earth-plates, or other conductors, at either end, so as to form two independent closed circuits, the inclosed conductor might be employed to convey electrical currents, without any inductive effect being perceived in a circuit extending parallel with, or in the neighborhood of it; the outside conductor (which in this case cannot be used as a medium for communication) intercepts the induced currents on all the inducing circuits, and in its closed circuit absorbs them. As in a system of this kind the outside conductors could not be utilized in the formation of circuits for purposes of communication, it is admitted that, apart from the bulkiness necessarily attending it, the first cost of a series of electrical circuits constructed upon that plan renders the system comparatively impractical; whereas, in the system advanced by Mr. Gisborne, the construction is much cheaper, and all of the conductors form an integral part of the communicating circuits, so that space is economized to the fullest extent.

People interested in electrical matters should not defer their visit to the Electrical Exposition, as it remains open but ten days longer.

The Japanese Government has sent a special officer to Philadelphia for the purpose of inspecting the Electrical Exhibition and reporting on the electrical industries of the United States, Ichisuke Fujioka, M. E., professor of electrical engineering in the Imperial College of engineers, at Tokio, Japan. He is accompanied by Naito Ruyiro, Charge d'Affaires of Japan at Washington. The professor pays daily visits to the exhibition and expresses himself as greatly pleased with the various exhibits.

Notes of the Exhibition.

The tall truncated cone in the Edison exhibit, stuck full of lamps, has been lighted up in spirals, and makes an exceedingly handsome object. Indeed it would be hard to say too much in praise of the Edison exhibit, which is complete and perfect in every detail, and has enough in it to engage one's study and attention for a week. Certainly no brain has been more prolific in invention than Mr. Edison, and no company has been more liberal in putting out its money and proving its faith by its works than has the company of capitalists who stand behind him.

It is a good deal with Mr. Edison as it was with poor Mr. Lincoln,—only a very small proportion of the stories told about him have any element of truth in them. There is no one with whom it is a greater pleasure to talk, no one who can grasp an idea more quickly, or communicate one more lucidly, no one who has a clearer judgment as to the practical and commercial value of an invention as separate and distinct from its scientific value. He is free in his praise of anything new or valuable, and more than one exhibitor at the show has been made happy, and more than compensated for all trouble and expense, by a few hearty and sincere words of commendation from Mr. Edison. He is a very important part of the exhibition, and is welcomed wherever he shows his face. His little daughter, in deep mourning for her mother, is his constant and inseparable companion, and it is a touching and pathetic sight to see them going about hand in hand, the observed of all observers.

The decision that has just been given in New York, by which last winter's law has been interpreted to mean that no more overhead construction is allowable, has caused a flutter among the "underground system" folks at the exhibition, each of whom, in his own estimation, has the only real and perfect system. It is laughable to hear some of them talk, and it is pitiful to think of those who have put their money into some of these schemes. I am one of those who believe that the time will come when, in the crowded parts of our great cities, the great bulk of the wires will go underground, just as I believe that the time will come when the great bulk of the travel between Wall street in New York and the region above Central Park will be by means of a railroad—electric, it may be—running through tunnels such as are used by the underground railways of London. But just as I do not expect to see the present elevated roads taken down, I do not expect to see overhead wires disappear entirely. More than this, I do not expect that electrical companies, having experts in their service, are going to take up with any or all the so-called "systems." A great deal of money has already been sunk in underground experiments, and, before the right thing is got, a very great deal more has got to be sunk in the same way, but I do hope that the amount will be kept down as low as possible, and that, with this end in view, these catch-penny affairs, which have no scientific basis to rest upon, and which have been subjected to no test anywhere, will be absolutely and wholly counted out.

Messrs. Abdank-Abakanowicz, Betbrand, Duche, Guerout, Kern and Napoli constitute the scientific commission sent to this country by the *Lumiere Electrique* of Paris. They are now making a critical examination of everything in the exhibition, and are to be seen every day among the exhibits, asking questions and taking notes. When the exhibition closes they will separate and visit different parts of the country, uniting again in New Orleans to visit the exhibition there, after which they will visit Havanna, and return home, when the results of these investigations will be given to the public.

I had the pleasure of a long and pleasant chat with Mr. Cassidy, who came all the way from Honolulu to see the show. He tells me that when a man of war drops into that port the first thing done is to order a telephone put into the cabin, and that a light insulated wire is reeled out, connecting the ship with the exchange, so that during her stay the officers have constant communication with the shore. When the ship leaves the wire is taken up and held in readiness for the next arrival, but the telephone and transmitter, being sold outright, go sailing away. It would be interesting to know what becomes of them.

Over here in Philadelphia there is just now a good deal of talk about the great suit that is in progress before Judge Wallace in New York, and the funeral catafalque that represents the Drawbaugh exhibit attracts a great deal of attention. Everybody wants to know what everybody else thinks about the outcome of the suit, and usually everybody has an opinion to express. Considering that we have waited all these years for an authoritative answer it seems as though we might be patient a little longer. The Judge has got to read those seven thousand pages of evidence, and digest the arguments that are to be made before him, and then, if still alive and sane, he will give his opinion. We have got to wait, anyhow, and we may as well do it with good grace.

The general impression left on the minds of those who attended the Telephone Convention seems to be that the Continental Hotel fixes its tariff of rates with a view to revenue only. Certainly a man gets less at the Continental, and pays more for it, than at any other third-class hotel in the country. For this and other reasons, which it is needless to name, it does not seem probable that Philadelphia will have another chance to snub the telephone men of the country. For a city which boasts its brotherly love, it made a mighty poor showing, a showing of which cities making less pretences would be heartily ashamed.

I have been a good deal interested in the exhibit made by the Westinghouse people of interlocking switch and signal apparatus by a combination of compressed air and electricity. We have all seen the switch-houses along the principal lines of railroad, in which are a number of heavy levers that operate switches at a distance by means of iron rods. What old-fashioned house-bells with wire connections are to electric bells, these are to the devices under consideration. All that can be done with sixteen long and heavy levers, requiring a man's full strength to operate any one of them, is now accomplished at and by a little key-board three feet long and a foot wide, upon which are a number of keys which open and close circuits, thereby opening and closing valves at a distance, and admitting or discharging the compressed air which, constantly supplied by a compressor, is the force which actually does the work. The "inter-locking" feature is complete, so that a collision at a crossing or a slide into the river because of an open drawbridge is physically impossible. The whole thing is a wonderful, valuable, and interesting device for securing safety to persons and property, and for saving labor in doing it. It is already in use in an experimental way on several roads, and it will indeed be strange if it is not generally adopted.

People complain that there is nothing new here at the Exhibition. If they mean nothing that they have not already seen, they speak unadvisedly and hastily. If they mean that there is nothing of which they have not heard, they must blame the press. Take Delaney's multiplex, for instance. Everybody has heard of it, because all the papers have had something to say about it. Hence, it is old to the ear. But to ninety-nine out of every hundred that come here it is new to the eye, and is as much a novelty as anything can be in these days of eager newspaper competition and the rapid dissemination of news.

Speaking of the multiplex reminds me to say that it is the special terror and horror of telephone men. "If you are going to get on," said Pat, when his horse accidentally caught his hind hoof in the dangling stirrup, "I may as well get off;" and so, whenever a line over which the multiplex is being worked is anywhere within gunshot of a telephone line, telephony may as well stop. How nice it will be when a lot of the multiplex company's wires are put into that big conduit that is to be built under Broadway, to carry all the wires of all kinds, and all the steam, water, gas, compressed air and other pipes, to say nothing of the cables which are to be kept in motion all the time, delivering power all the time as wanted. There will be not only "cross-talk," but "back-talk," and it will be of a very lurid sort.

Mr. Edison tells me that his company is going to put down a section of his underground conductors for the Metropolitan Telephone and Telegraph Company of New York, the Edison Company to guarantee its satisfactory operation for five years. This recent decision, forbidding further overhead construction has brought things up with a round turn.

Mr. Lytle and Mr. Duxbury took me up into a room in the Continental and showed me a very ingenious device for making glass insulators. It seems that there are now two ways of making them. One is to form them in a mould, minus the thread which screws upon the peg, and blow in the thread afterwards. The other is to form them in a mould with the thread part blank, and, while the glass is still hot, screw in a tap and screw it out again. Both these methods are slow, result in much waste and breakage, and, at best, produce imperfect results. The new device is to use a mould which makes the whole thing at one motion, thread and all, and then, by collapsing the tap which makes the thread, allows it to be withdrawn. The result is an insulator perfect in form, with a thread so accurately made that it bears upon the screw of the peg at every point, thus obviating a frequent and troublesome cause of breakage, and is cheaper to produce than in the old way because made in one motion instead of two or three. The friends who showed me this and explained its advantages are, as I understand it, interested in the patents covering the improvement, and will no doubt be heard from at an early day.

By the way, I have been shown another insulator, made of *papier mache* saturated with asphalt, or some such substance. The claim is that it is a far better insulator than glass, and far cheaper to make. Of course it could be moulded into any form, and no doubt glass-making machinery could be adapted to it. Somehow its surface does not suit me exactly. It seems as though dust would find a firm footing on it, and that then its high insulating properties would be gone. I may be wrong, but it seems as though, in very hot weather, the sun might soften the asphalt enough to make it hold dust and dirt, and I am by no means satisfied that the surface would not become disintegrated and broken after continued exposure to alternate heat and cold. Even glass will undergo this change of surface in time, but it takes so long that it is never a cause of trouble. But anything that will cheapen and improve telegraph and telephone construction will prove a blessing, and so I hope that the new *papier mache* insulator will be accorded a full and fair test.

It was James Russell Lowell, just now American Minister at the Court of St. James, but far more famous and noted as the author of the "Bigelow Papers," who wrote the lines:

> "Once get the smell of musk into a drawer,
> And it sticks there like precedents in law."

and it seems that it is a good deal so with mercury fumes in the bulbs for incandescent lights which have been exhausted by means of a mercury air pump. Pump away as long as you will, reduce the amount of air to a millionth or half a millionth, or as much further as you can, still the volatilized mercury remains in suspension in the bulb, and shows the mercury line clearly and unmistakably when examined through a spectroscope. As a young but enthusiastic electrician expressed it, "it is the biggest bug in the business."

They say that Prof. Bell, not satisfied with using a sunbeam as a conductor, has devised a means of telegraphing between two ships five miles apart, using the water only as a conductor, and having no cable or wire of any kind. More than this, he is at work, and with good hopes of success, to devise means of telephoning between two ships so situated, also using the water as his sole conductor. Don't ask me to tell how it is done. I don't know. "I tell the tale as told to me." Were a man to tell me that he could telephone to the moon I should not deny it. I should simply ask for the latest news from fair Lena.

The attendance keeps up well. It is thin through the day, greatly to the advantage of those who wish to study and examine carefully and critically, but in the evening it is very large, so large, in fact, that the financial success of the exhibition seems assured. Several schools have been turned loose in the building of afternoons lately, and the pupils, mostly girls belonging to the more advanced classes, have shown much interest in the exhibits. This is certainly a move in the right direction, for nothing is more important than that the public at large should have as much general knowledge of electricity its possibilities and limitations as possible. To spur the pupils of the schools to see the exhibition intelligently, the management has offered prizes for the best essay, written by pupils of the Public Schools, on "What I Saw at the Exhibition."

I can't help feeling that if a little more attention had been shown to economy in space, and if allotments had been based on the actual needs of exhibitors, the whole exhibition might have been kept within the walls and under the roof of the main building. The annex is a most inconvenient and un-get-at-able place, which might well have been omitted. To be sure the large hall is there, but it is almost useless for the purpose of holding meetings, so bad are its acoustic properties. It is the old passenger room of the West Philadelphia station of the Pennsylvania Railroad, and is just suited to the purposes for which it was built.

It is a pity that so many exhibitors take no pains at all to have anyone on hand to answer questions. It is perfectly reasonable and proper when people see a thing which they want to understand, to want to ask about. If no one is there they pass on, the exhibit makes no impression upon them, and the exhibitor is, or may be, the loser. This criticism does not apply to the "underground" folk. They are on hand in force, and only too glad to get a change to tell you the thousand-and-one things they don't know about induction, retardation, etc.

The Palmer Wire Company has shown its usual enterprise in publishing a neat little table of resistances, weights, etc., and other useful information, bound in leather, which were distributed free at the meeting of the Telephone Association, Philadelphia. That the table was appreciated is attested by the fact that the first edition of 250 copies is already exhausted, and another is being got ready.

In default of a submarine cable the heliograph service between the islands of Reunion and Mauritius is in a fair way of being carried out. In Reunion M. Adam has connected the hill of Lacroix by heliograph with a station situated at St. Benoit, from which a telegraph runs to St. Denis. Recent experiments between Lacroix and the Pic Vert in Mauritius, have shown that a heliographic communication is quite feasible between them. At Mauritius the Pic Vert station will heliograph its messages to the Pouce Mountain, celebrated in "Paul and Virginia" and from thence the messages will go by wire to Port Louis.

*** King Kalakua is one of the best patrons of the Honolulu telephone exchange, using no less than sixteen instruments at his palace and other residences.

*** The New England Telephone Company is putting its earnings to good use in construction and reconstruction. It inherited from its constituent companies a great deal of old, hasty, and unsatisfactory work, and it has cost no little money, time, and energy to bring things up to the required standard. With the vigorous work now under way it is believed that everything will be in shape by November 1st, and that after that no further drafts on earnings will be required for construction purposes. The fact is that the New England company has seen its darkest days, and that light is clearly visible ahead. We fully expect to see a dividend next July.

*** John O'Brien, foreman in the employ of the Metropolitan Telephone and Telegraph Company, was, with laborers, overhauling lines at Seventh Avenue and Twenty-second Street last Saturday, when Officer J. J. McDermott, of the Twenty-ninth Precinct, arrested him. Notice was sent to Burton N. Harrison, secretary of the company, and he appeared for O'Brien at the Jefferson Market Police Court. Mr. Harrison said that the new statute compelling wires to be placed under ground did not go into effect until November, 1885, and that a case to test the law was now before Justice Van Brunt, in the Supreme Court. The company had made application to Hubert O Thompson for permission to put its wires under ground. At Mr. Harrison's request O'Brien was paroled into his custody pending Justice Van Brunt's decision.

*** The important telephonic arrangements of the new Palais de Justice, Brussels, have lately been extended, the office of the public prosecutor's *parquet* and the private rooms of the magistrates being provided with telephonic instruments. All the transmitters in the various courts are put in connection with a central switch in the telegraph office. This is intended to place the magistrates in communication with counsel; and the latter, by means of an instrument of the Bell Telephone Company, are able to correspond with the subscribers of the Brussels, Uccle, and Boitsfort (suburbs of Brussels) lines, and will soon be able to hold converse with their brethren of the bar in Antwerp, Ghent, Liege, Verviers, and other towns. The first telephone instruments were of the Ader system, with De Gilliland magneto calls, but the last transmitters just added are much improved, thanks to a new arrangement of carbon and contacts, devised by M. Van Rysselberge. While the external form is not altered the transmitter is fixed to a board, and the magneto call is placed above the microphone. As to the other electrical appliances fixed in the various courts, their choice and arrangement, and the ingenious combinations devised by the officials appointed to direct the works are calculated to interest those connected with the applications of electricity. A few figures will suffice to give an idea of the importance of these installations:—110 electric calls of the Lippens type, that is adopted by the Belgian Government, are placed in the various courts, and correspond with 26 indicators, forming together 88 numbers, which communicate with 164 small pushes. A special conductor has been chosen to connect these instruments. It is so constructed that the copper wire, a full millimeter in diameter, is sufficiently protected to prevent any fear of oxidation through damp, being covered with nearly 2½ millimeters of gutta percha and plaited cotton paraffined. The total length of the circuit connecting the whole of these instruments is nearly 30,000 meters (98,426ft.), and there are 600 Leclanche batteries.—*Ex.*

The Telephone.

Our esteemed contemporary, the *Scientific American*, says that "one of the most striking characteristics of the present age is the marvelous rapidity with which useful inventions are introduced. The telephone is a striking example of this. The first public exhibition of the telephone was in the year 1876, at the Centennial Exhibition in Philadelphia. In the following year the first telephone exchange was established in Boston with five subscribers. With extraordinary forethought, the primitive switchboard was made long enough to contain switches for five subscribers in addition to those who originally joined the exchange. It soon became evident that the telephone system was destined to extend more rapidly than was at first believed possible, and the original switchboard was never filled up, but was supplanted by a more comprehensive arrangement.

To give an idea of the rapid development of telephonic communication, it may be interesting to show how the Boston exchange has grown to its present proportions. It has many times outgrown its quarters, and besides the principal exchange, there are two branch offices and seventeen suburban exchanges in direct connection, and more than 200 cities and villages in New England may be reached by telephone from Boston. The new "central office" is furnished with the latest form of multiple switchboard, manufactured by the Western Electric Company, in Chicago. The capacity of this board is 3,500 lines, and together with the two branch offices gives Boston a capacity for nearly 6,000 lines. The number of subscribers in Boston, April 1, 1884, was 2,386. Taking the increase in the United States, the figures are even more startling. In May, 1877, there was but one exchange with five subscribers; in January, 1884, there were 906 exchanges, with 123,625 subscribers.

Although the telephone has attained its present importance within the last decade, and the first announcement of Prof. Bell's invention must be still fresh in the memories of most of our readers, yet a concise history of this wonderful invention will not be out of place.

The credit of first conceiving the possibility of transmitting articulate sounds by electricity is due to Prof. A. Graham Bell. His familiarity with the applied sciences, particularly acoustics, dates from early youth. He was instructed by his father, who was engaged in the difficult task of teaching the deaf to articulate, in the physiology of the human throat and ear. Even when quite a boy, young Bell had ingenuity enough to construct a talking machine which would utter one or two simple words. About ten years ago Prof. Bell was engaged in increasing the efficiency of the electric telegraph by employing the vibrations of reeds of different pitch in connection with the usual telegraphic apparatus. While engaged in perfecting his system of harmonic telegraphy, he conceived a method of making a complicated receiver, consisting principally of a set of reeds of different pitch, giving forth tones corresponding to those entering a similar transmitter connected by an electric current with the receiver; much as the strings of a piano will respond to the human voice. Coupled with the then recent discovery of Helmholtz, that the vowels and other vocal sounds were simply the combination of several elementary notes, Prof. Bell at once perceived the possibility of transmitting speech.

It only remained to try the experiment, and to improve and simplify the apparatus, in order to make his invention practically useful in every day life.

Immediately on the publication of Prof. Bell's success in transmitting speech by electricity, the whole scientific world turned with interest to the new wonder. Many improvements were soon made in the details of the telephone; and other inventors, as Edison and Blake, produced transmitters of greater power and better suited for actual service than Prof. Bell's instrument. As a receiving telephone, however, Prof. Bell's invention is in universal use in almost the exact original form, and it seems unlikely that it will be superseded by any other receiver, so perfect and simple is it at the present time.

The extent and variety of experimental work for improving the telephone now being carried on by the American Bell Telephone Company, and the facilities which they possess for continuing this work, are not generally known, and it is our object to illustrate and describe these facilities. Inventions connected with the telephone are continually being offered to the company, and those which appear to have merit are carefully examined, and adopted or rejected according to their value. Often those inventions which are purchased by the company require more or less modification to adapt them to practical use. To successfully carry out the objects indicated above, the company employs a corps of expert mechanics and others skilled in the principles and practice of electricity and its allied sciences, and has provided an experimental shop, a chemical laboratory, and an electrical testing-room, fully equipped with the necessary machinery and apparatus. The experimental shop is remarkably well supplied with such tools as are required for producing and altering electrical apparatus. It has a full complement of iron and brass working machine tools, carpenters' and mechanics' benches, forges, and other mechanical appliances. Power is supplied by a gas engine.

In addition to this purely experimental work, the department is continually making tests of samples of wires of insulating material, and of supplies of various kinds, both as a basis of purchase and to maintain the required standard of quality. For these purposes special apparatus is provided where it is required; as, for example, tensile and torsional wire-testing machines. Perhaps the most important tests made are those upon the telephones and transmitters manufactured for the company by the Western Electric Company, of New York, Chicago, and Boston. As this company is licensed to manufacture electrical apparatus and supplies under all the patents owned and controlled by the American Bell Telephone Company, and actually produces upward of 50,000 new telephones yearly, the magnitude of the work of testing is very great. Large numbers of telephones are sent abroad, as nearly all the telephonic apparatus used in Belgium, Holland, Norway, Sweden, Russia, and Italy is made in this country.

Very interesting and expensive experiments are often undertaken by the company. Among these may be mentioned experiments in long-distance telephoning. A heavy copper metallic-circuit line, nearly 300 miles long, has been erected between New York and Boston, and conversation is carried on between those cities with perfect ease, much more satisfactorily, in truth, than over most of the local city circuits. Plans are now being perfected for overcoming certain difficulties in connecting local subscribers to this trunk line, in order to insure satisfactory service and insure commercial success. This line will undoubtedly be soon in the hands of the local company, and open for public use. The results thus far attained point to a speedy solution of the long-line problem; and in a few months the wonder will be why long-distance telephoning was not sooner introduced.

In order to meet as far as possible the public demand for underground wires, the company has been and is now making extended experiments upon various makes of subterranean cables, with as yet only partial success. To give an idea of the vast sums of money the company is expending in this experimental work, it is only necessary to state as a single example that one of these cable experiments cost $30,000, and that this is by no means the maximum outlay for a single experiment.

Recently an invention has been brought out for making the telephone an accurate timekeeper. By means of a simple apparatus, including an accurate clock stationed at the central office, a signal is given once a minute indicating the precise time, somewhat after the manner of a repeater watch. This system is now on trial at Lowell, Mass., and seems likely to be generally introduced.

The Bell telephone exhibit at the Electrical Exhibition now in progress at Philadelphia is well worth the careful attention of visitors. It forms one of the most prominent features of the exhibition. The whole history of the telephone, from its first conception to the present complex system, is well illustrated by models, some of the original apparatus being on exhibition. Many forms of apparatus now discarded from use are shown; and all the latest improvements, including the most recent style of multiple switchboard, may be seen.

Telephony In South Australia.

A VISIT TO THE ADELAIDE EXCHANGE.

The following special report from the *South Australian Register* will give a good idea of the manner in which telephony is viewed and is progressing in Australia:

A short time ago a London journalist visited the office of the Indo-European Telegraph Company, which occupies an unpretentious building in Old Broad-street, and made an inspection of the wonderful line between England and Teheran, the capital of Persia, the length of which is 3,800 miles. He says that the clerk in charge informed him that he wires through to Emden, and "with the same ease with which one wires from the city to the West End." He asked a few questions of the telegraphist in the German town. When he had finished he spoke with the same facility to the gentleman on duty at Odessa. This did not satisfy him, and in a few seconds he was through to Teheran. From here he passed to Kurrachee, then to Agra, and from Agra he was switched on to another line, and was "soon talking to a native telegraphist at the Indian Government Cable Station, Calcutta." Thus he had, by means of automatic repeaters, communication without break over 7,000 miles of wire, and he attests that the signals were excellent, and that the speed attained was not less than twelve words per minute. This is a most remarkable feat, and one may well ask, where will the achievements of science end? From the Post Office at Adelaide it is as easy to speak Port Darwin as it is to speak Port Adelaide, although the distance in the former case is about 2,000 miles. And, what is more wonderful still, messages have been received from England in less than an hour. On the occasion of the opening of the Melbourne Exhibition a message to the Queen was through from Melbourne to Windsor in forty minutes, and I am informed that in one instance the result of a Derby race reached this colony from England in twenty minutes. If a direct line throughout the whole of the distance were practicable the time would be reduced to as many seconds. The number of messages dispatched by these lines has increased with great rapidity. In 1878 the number forwarded by the colonies was 9,283, and the number received by the colonies 8,161, making a total of 17,444 messages, on which were paid £146,125, the South Australian proportion being £16,421. In 1883 the number of messages forwarded from the colonies was 21,771, and the number received by the colonies 21,563, making a total of 43,334 messages, yielding a revenue of £251,278, of which the proportion accruing to South Australia was £27,510. The rate over which messages to Europe travel may not be generally known. The overland line joins the cables at Port Darwin, and the cables cross to Banjoewangie, the southernmost point of Java. The old cable joins a line which goes through Java to Batavia, and from thence the communication is continued to Singapore, Penang, and eventually to Madras, where the ordinary Indian lines are reached. The new cable goes from Banjoewangie to Singapore direct, avoiding Java, where Dutch operators are employed, with results that are sometimes most harassing to the persons who receive the messages at this end. We cannot boast of lines equal to those of the Indo-European Telegraph Company; but our system is one of which we have good reason to be proud. We have made great progress in this respect, and the day may come when we shall be able to go

to some exchange of telegraphy or telephony and converse with our friends "at home" with almost as much freedom as if they were speaking to us across our garden fence. When Volta made his discoveries no one anticipated that we should ever flash messages around the world; and when Wheatstone conveyed the sounds of a musical box from a cellar to an upper room by means of what came to be known as the "Enchanted Lyre," it was not even suggested that the time would come when articulate speech would be transmitted over hundreds of miles. We have long since learnt that there are more things in heaven and earth than are dreamt of in our philosophy, and there are few persons who will be disposed to say that science has yet reached its highest point of development. The telegraph and the telephone are among the greatest triumphs of human skill, and both inventions have been applied in South Australia. The principle and mode of operation of the telegraph are well known, but there is a degree of novelty attaching to the telephone, and it is the latter instrument which is to be the special subject of my sketch.

THE INVENTION AND THE IMPROVEMENT OF THE TELEPHONE.

The original of the telephone now in use was discovered by Prof. A. Graham Bell in 1877. This consists of a thin disc of iron placed in front of a permanent magnet surrounded by a coil of insulated copper wire. The sound of the voice speaking causes a vibration of the disc, a current of electricity is generated, which being sent round a similar coil on a distant magnet repeats the vibration on another disc, and reproduces the sound. In short, sound is converted into electricity, and electricity is reconverted into sound. This instrument was employed as both a transmitter and a receiver, and it was found by experience that it was not of any practical value for ordinary purposes, inasmuch as the sounds it gave, although distinct, were weak. Something was required to complete the invention, and this something was supplied by Prof. H. E. Hughes in what is known as the microphone. This instrument multiplies sound just as the microscope multiples the field of sight. It consists of two pieces of carbon attached to a diaphragm, which are made to recede from and approach to each other by the vibration caused by the sound of the voice and to offer a variable resistance to the electric current which is generated. The current passes through a primary wire of a small induction coil, and produces a corresponding current in the secondary wire by which it is enveloped. This secondary, or "induced," current is transmitted through the line, and reproduces the speech in the receiver at the other end. The microphone is now used as the transmitter, and the Bell telephone as the receiver, and in addition to these another instrument is required, which may be described as the "call." This may be either magneto-electric or galvanic. In the former the currents are generated by turning a handle, which revolves an armature containing a coil of very fine copper wire between the poles of permanent magnets, and causes alternating currents by which the bells are rung. In the latter a battery, generally of the Leclanche type, is employed; but there are various objections to this system, and the magneto-electric is the one which is most generally adopted.

THE TELEPHONE IN SOUTH AUSTRALIA.

The Postmaster-General (Mr. Todd) and his able assistant in this department (Mr. C. Unbehaun) have devoted close attention to the study of the telephone ever since its invention by Professor Bell. The improvements have been followed, and numerous experiments conducted with the view of ascertaining which was the best of the various systems brought out. In the first instance imitations of the original instrument were constructed from drawings in the scientific journals, and subsequently a variety of different instruments were obtained from England, including the Gower-Bell, which is the system adopted by the postal authorities in England. Mr. Todd eventually selected the Blake transmitter, which is a modification of the microphone, the Bell receiver in the form known as the "Pony-crown and the "Swiss" telephone. In the year 1880 Mr. Todd submitted a memorandum to the Minister of Education in which he recommended the Government to establish a Telephone Exchange; and in 1881 a Bill was introduced in the House of Assembly by the Hon. J. L. Parsons for the purpose of giving effect to the scheme Mr. Todd proposed. The Bill gave the Government the exclusive right to erect and maintain telephone lines in the colony, and it rapidly passed through both Houses of the Legislature, the only objection raised to it being based upon what has since proved to be an erroneous assumption that it would interfere with the success of the telegraphic system, and would not contribute anything to the revenue. The Act was first brought into operation in 1882, when a number of private lines were laid down and leased, and the Telephone Exchange was not opened until May of last year. At that time the number of subscribers was only twenty-five, whereas the number at the present time is 263, of which 217 are connected with the Adelaide Exchange and 46 with the Port Adelaide Exchange. In addition to this there are 156 private lines. This is very satisfactory progress, and, considering its age, the exchange will now bear favorable comparison with the exchanges in the other colonies. The number of subscribers in the other colonies at the commencement of this year was as follows: Melbourne 650, Ballarat 81, Sandhurst 31, Sydney 260, Dunedin 237, Auckland 151, Christchurch 125, and Wellington 60. In addition to the exchanges at Adelaide and Port Adelaide, the telegraph offices at the exchange (Pirie street), Rundle street, Adelaide Railway Station, Unley, Norwood, North Adelaide, and Hindmarsh are connected, and the Semaphore and Large Bay Railway Station are to be added. Branch exchanges are also to be established at the Semaphore and at Mount Lofty, and if the business increases, as it has hitherto done, further extensions will soon become necessary. There are about 700 sets of telephones now in use, and the greater proportion of these have been purchased from the Western Electric Telegraph Company of Chicago, whose instruments are considered to be superior to those manufactured in England. The total length of wire erected is 983 miles, and the longest telephone lines are the following:—Government House to Marble Hill, 13 miles; M'Culloch—Goolwa to Port Victor, 11 miles; Cave and Co. (S. A.) to Crafers, 10 miles. Mr. Cave joins his Port wire to the Crafers line, and the length is thus increased to 18 miles. The above does not include the railway telephone lines, the longest of which is from Kapunda to North-West Bend, 56 miles, and from Burra to Petersburg, 55 miles. The charges made to subscribers are lower than those imposed by the postal authorities in England, and some special facilities are afforded, some of which do not pertain elsewhere. For instance, clause 14 of the regulations provides that chemists situated along any existing line of telegraph or telephone within a distance of five miles from a telephone exchange may be connected with such exchange on payment of a subscription of £14 per annum, on the understanding that persons will be allowed to consult any medical subscriber on payment of 6d. for every five minutes, or free of charge where the medical subscriber pays the additional £9 a year. The telephone must be available for purposes of medical consultation day and night; but a private fee of 2s. may be charged during the night, or between the hours of 10 P. M. and 7 A. M. This is a novel arrangement, and the value of it is obvious.

AT THE EXCHANGE.

The system upon which the exchange is worked is very simple. All the subscribers' lines are brought to a focus at the center. If a subscriber desires to speak to another subscriber he rings up the exchange, states with whom he wishes to communicate, and is at once connected. To see how things are done I visited the exchange, which occupies what is known as the check room at the general post office. I was taken up stairs through a long room in which a host of telegraphists are at work, and into the *sanctum sanctorum*, in which the young lady attendants sit at the telephonic switchboard and answer the calls of subscribers. There were two operators employed in this work, and they were as busy as they could well be replying to the calls and making the necessary connections. The switchboard consists of a series of enunciators with deep shutters, each of which bears the number of a subscriber. Jack-knife switches, corresponding to the enunciators, are placed below; and at the bottom is a row of clearing-out shutters. On the switchboard are two rows of buttons with contact keys, having flexible cords, with plugs attached, which are used for completing the circuit between any two subscribers. When a subscriber rings the shutter of the enunciators with which he is connected drops, and the attendant at once places one of the plugs in the corresponding switch. Having done this, she gives the reply ring by pressing a key, which causes an electric current to pass along the line. The arrangement adopted is a novel one, and, I was informed, is not in use elsewhere. A small turbine, connected with the water service, drives a small magneto-electric machine, which is kept in the crypt in the basement of the building. This supplies the current which rings the bell, and the necessity which before existed of turning a handle, as is done at the subscribers' end, is obviated. The attendant afterwards presses the speaking key, and asks the subscriber with whom he wishes to speak. He replies, and the attendant takes a second plug, and places it in the proper switch, when the connection is complete, and the parties may carry on their conversation in perfect secrecy. When they have finished a signal is given which throws down the clearing-out shutter, and the attendant draws the plugs in readiness for the next call. The whole operation does not occupy more than a few seconds, and the young ladies are able to reply to the requests of subscribers with remarkable rapidity. The number of communications per diem through this exchange is about 1,000 and there is room for almost unlimited extension, the capabilities of the machinery being dependent only on the number of attendants employed.

.... Among the most interesting of the historical exhibits at the Franklin Institute Exhibition are several rough-looking, home-made electro-magnets, formerly belonging to Professor Henry, one of which is labeled "Henry's Great Magnet, 1833." When the multiform uses of electro-magnets are considered, together with the story of Joseph Henry's early experiments and discoveries, a practical illustration is afforded of the benefits to mankind that arise from purely scientific investigations carried on too often (as was the case with these investigations by Henry, in hours which should have been given to rest from the exacting demands of a teacher's life. When he began his work of electrical investigation the electro-magnet was a new discovery, receiving the closest attention of the scientific world. A bar of soft iron was covered with a non-conducting substance, and this being wound with a copper conjunctive wire, through which a current of electricity was passed, the soft iron core became magnetic so long as the current was kept in motion. As early as 1827 Henry improved upon this, which was known as Sturgeon's magnet, by using a manifold coil of insulated fine wire. The use of many turns of fine wire was not a discovery, but a practical application of a device of Schweigger, employed to increase the sensitiveness of a galvanometer. Henry's device of insulating the wire instead of using naked wire around an insulated core was, however, a great improvement, enabling him to use a much longer, more compact coil, in better position with respect to the magnetic axis than the loosely coiled short wire heretofore used. Thus was produced the magnetic bobbin or spool which is Henry's invention.

TELEGRAPHIC

.... It is understood that President Mott, of the Bankers and Merchants' Telegraph Company, will be appointed receiver in a few days. The Bankers and Merchants' people say that alliance with the Baltimore and Ohio weakened them, as the Baltimore and Ohio Company had very light earnings.

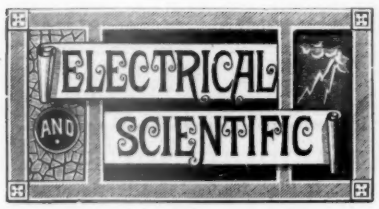
.... Mr. Sully, one of the general officers of the Bankers and Merchants' Telegraph Company, says that for the protection of all concerned the property should be placed in the hands of a receiver at once. He further states that within thirty days a plan for reorganization will be devised, and that will again put the property on a good basis.

.... At the annual meeting of the Great Northwestern Telegraph Company the following directors were elected: Charles Tinker and Erastus Wiman, of New York; Hon. William McDougal, of Ottawa; A. S. Irving, James Hidley and William Gooderham, of Toronto; Richard Fuller and Adam Brown, of Hamilton; and O. S. Wood, of Montreal. Erastus Wiman was re-elected president, and William Gooderham vice-president.

.... Some time since the Dominion government refused to allow the American Telegraph Company to land its cable on Canadian territory at Vancouver island. It now turns out that the Dominion government desires to run a cable across the sound from Victoria, B. C., to Washington territory, but, remembering the manner in which Americans were refused a similar privilege, the United States authorities now decline to grant permission to the Canadian government to land. The matter was laid before Secretary of State Chapleau recently, who promised to look into it. The cable, which was imported from England in March, lies idle in a Victoria warehouse.

.... The Railroad Commissioners gave a hearing last week, in Boston, in accordance with the resolution of the Legislature of 1884 instructing them to investigate the subject of the occupation of railroad locations by more than one company for the purpose of transmitting intelligence by electricity, including the necessity for and propriety of such occupation, the terms and conditions under which the same may be properly and safely permitted, the character and nature of the structures to be used, and the regulation of their construction, repair, maintenance, and operation. The various corporations were represented at the hearing as follows: Baltimore and Ohio Telegraph Company, by Parker C. Chandler, counsel, and D. H. Bates, vice-president; Old Colony Railroad, by C. F. Choate, president; Providence Railroad, by William G. Russell, counsel; Boston and Albany, by Judge Soule, counsel, and J. H. Barnes, superintendent; Boston and Maine, by James T. Furber, superintendent; Fitchburg Railroad, by G. A. Torrey, counsel; Eastern Railroad, by Messrs. Olney and Stevens, counsel.

.... The interest upon the $3,000,000 first mortgage bonds of the American Rapid Telegraph Company, due last week, was not paid. A majority of the stock of the company is owned by the Bankers and Merchants' Telegraph Company, which is also the lessee of the property of the Rapid. The officers of the Bankers and Merchants' say that according to the terms of the mortgage the bondholders cannot take advantage of the default until the expiration of six months from date. The bonds are not guaranteed by the Bankers and Merchants', but it is understood that the lease provides that a certain proportion of the earnings of the leased lines shall be set apart to pay the interest upon the bonds referred to. The Bankers and Merchants' is somewhat similarly situated regarding the bonds of the Southern Telegraph Company, the issue of which is $2,500,000. It holds a majority of the bonds. It is learned that all of the $10,000,000 of first mortgage bonds of the Bankers and Merchants' have practically been issued. About one-third were sold and the balance have been hypothecated or given in payment for construction and supplies, or as security for the same.—*New York Sun.*



* * Attention is called once more to the course of eighteen lectures by Sir William Thomson, on molecular dynamics, at the Johns Hopkins university in October. Professors and students of physics are invited to attend.

* * An electric horse chronometer has been invented. The movement is controlled by a current opened and closed by the breaking of an almost microscopic copper wire stretched across the track. It is said to record to the $\frac{1}{500}$ of a second.

* * The following persons were elected officers of the American Association for the Advancement of Science for the ensuing year: President, H. A. Newton, of New Haven, Conn.; permanent secretary, F. W. Putnam, of Cambridge (office, Salem, Mass.); general secretary, Charles Sedgwick Minot, of Boston, Mass.; assistant general secretary, Chas. C. Abbott, of Trenton, N.J.; treasurer; William Lilly, of Mauch Chunk. Section A, mathematics and astronomy—J. M. Van Vleck, of Middletown, Conn., vice-president; E. W. Hyde, of Cincinnati, O., secretary. Section B, physics—C. F. Brackett, of Princeton, N. J., vice-president; A. A. Michelson, of Cleveland, O., secretary. Section C, chemistry—W. R. Nichols, of Boston, Mass., vice-president; F. P. Dunnington, University of Virginia, Va., secretary. Section D, mechanical science—J. Burkitt Webb, of Ithaca, N. Y., vice-president; C. J. H. Woodbury, of Boston, secretary. Section E, geology and geography—Edward Orton, of Columbus, O., vice-president; H. Carvill Lewis, of Germantown, Pa., secretary. Section F, biology—Burt G. Wilder, of Ithaca, N. Y., vice-president; M. C. Fernald, of Orono, Me., secretary. Section G, histology and microscopy—S. H. Gage, of Ithaca, N. Y., vice-president; W. H. Walmsley, of Philadelphia, Pa., secretary. Section H, anthropology—W. H. Dall, of Washington, D. C., vice-president; Erminnie A. Smith, of Jersey City, N. J., secretary. Section I, economic science and statistics—Edward Atkinson, of Boston, Mass., vice-president; J. W. Chickering, of Washington, D. C., secretary.

* * Professor Rowland, in his opening address at the Exhibition, referred to the growing importance of encouraging something besides applied science. "To-day," he said, "our country by its liberal patent laws encourages applied science. We point to our inventions with pride, and our machinery in many of the arts is not surpassed, but in the cultivation of the pure sciences we are but children in the eyes of the world. Our country has now attained wealth, and this wealth should partly go in this direction. We have attained an honorable position in applied science, and now let us give back to the world what we have received in the shape of pure science. Thus shall we no longer be dependent, but shall earn our own science as well as invention. Let physical laboratories arise; let men of genius be placed at their head; and, best of all, let them be encouraged to pursue their work by the sympathy of those around them. Let the professors be given liberal salaries so that men of talent may be contented. Let technical schools also be founded and let them train men to carry forward the great work of applied science. Let them not be machines to grind out graduates by the thousand irrespective of quality, but let each one be trained in theoretical science, leaving most of his practical science to be learned afterward, avoiding, however, overtraining. Life is too short for one man to know everything, but it is not too short to know more than is taught in most of our technical schools. It is not telegraph operators, but electrical engineers that the future demands. We are but children studying the A B C of electricity, and it is knowledge that we want. We have no practical applications yet for some of the most important truths of electricity.

Some knowledge of electricity will soon be as necessary in high-class schools as a knowledge of geography or grammar, and the apparatus for teaching the new science is superb.

* * The Rhumkorff coil, so called from the French maker of these instruments, is based upon one of the discoveries of Prof. Henry. These coils depend upon the fact that whenever a current of electricity flows along a helix of copper wire, a so-called secondary current is induced in a second helix surrounding and parallel to the first. The first helix is known as the primary coil, and the current the primary current. The surrounding helix is the secondary coil, and the induced current is the secondary current. The secondary current is only induced when the primary current is made or broken, and hence mechanical means are adapted to make and break the current with greater or less rapidity. The intensity of the secondary current depends upon the quantity of current flowing along the primary coil, and upon the differences in size and length of the two wires composing the two coils. The greater the quantity of current in the primary coil, and the finer and longer the wire of the secondary coil, the greater the intensity of the secondary current. Of course a limit is reached, from the fact that when the wire is too small so intense a current will heat it up, and even fuse it inside the coil, and thus ruin the coil. The various coils must be most carefully insulated from each other for the same reason.

* * At the Electrical Conference, on Friday, the most interesting question of the day was "Induction in Telephone Wires, Long-Distance Telephoning and Underground Wires." An interesting paper by Mr. Thos. D. Lockwood, the Boston electrician, preceded the debate. He began by considering the noises heard through the telephone. These noises, he said, were much greater on long than on short lines, and also greater on lines running north and south than on those running east and west. These noises are the results of induction and various other causes, and the reason why telephone receivers are not greatly impressed and made more sensitive is because this, while it increases the volume of the sound of the messages, also takes in with greater facility the noises which are not wanted. The only thing, therefore, to be done at present is to improve the transmitter so as to get rid of, as far as possible, the induction and other evils. The noises heard through the telephone, which disturb the transmission of messages, were then described; sometimes they were like the sounds of whistling, frying, screaming, telegraphic signals from near telegraphic wires, and telephonic signals from other telephone wires. He proceeded then to point out the methods of relief adopted, and others that were proposed, and said that this problem of the improvement of the transmitter was the great one to be solved before his system could be perfected.

W. H. Preece, the great English authority on the subject, discussed the points made by Professor Lockwood, as also did President Rowland and others. It appeared to be the prevalent opinion that the laying of wires underground was not detrimental to induction, though the dangers of obstacles to the current might probably be increased. As regarded long-distance telephoning, the conference appeared to be of opinion that the distance to which a message might be sent will, in the very near future, be increased much beyond the expectations of even the most sanguine believers in this application of electricity. But it was scarcely time yet to talk of submarine telephones. Twenty miles, it was stated, was the longest distance at which conversation could be maintained through a submarine transmitter, and Mr. Lockwood said that, while under the most favorable conditions conversations had been held through the telephone from Boston to Denver, and even to San Francisco, it could not be said that any great practical results could be obtained at such long distances.

* * In an interesting and rather recondite article on Horology, a writer in a contemporary observes: "The date and authorship of the first wheel clock is appropriately shrouded in mystery. Stow says that clocks were first commanded to be set up in churches in 612. This, it may be hoped, is a legend, if only for the sake of Alfred's chaplain. Another authority states that the original wheel clock was sent by Pope Paul I. to Pepin, King of France, in 756. The striking clocks are ascribed to the Arabians. Rabanus Maurus bestowed one on a friend in the middle of the ninth century. Pacificus, Archdeacon of Verona, and Gerbert of Fleury, afterward Pope Sylvester II., are also competitors for the parentage of the first clock. It is tolerably certain that about the middle of the eleventh century clocks moved by weights and wheels began to be used all over Europe, and this is about all that can be stated with accuracy as to their origin. Their progress, however, was very steady from the first. A clock was the most unfailing device for pleasing or propitiating the great. Haroun-al Raschid sent one to Charlemagne of such a 'wonder artyfycyall makyng, that at euery oure of the daye and nyghte when the sayd clocke shuld stryke, images on horse backe apperyd out of sondry places.' Edward III. imported clockmakers from foreign countries, and Henry VIII. regularly bestowed these valuable gifts on his favorites. The clock of Anne Boleyn is now in the possession of Queen Victoria. The weights are chased with the initials of Henry and Anne within true lovers' knots. On one is inscribed the royal motto; on the other "The most happye" is written. Louis XIV. had a most curious clock manufactured for him. When the hour struck all the kings of Europe came forth and did homage to his French majesty. Overzeal, however, ruined the clock and the maker. Being desirous that the figure of William III. should do lowlier reverence than the others, he bent a spring too far. The whole of the machinery collapsed, the effigy of the great Louis fell at the feet of his arch enemy, and the would-be courtier went to the Bastile. The famous Earl of Leicester paid a more successful compliment to royalty. When Queen Elizabeth visited him at Kenilworth, the clocks stopped at the instant of her arrival, and Time was annihilated until Spenser's 'Mighty and magnificent Empress" took her departure."

* * The wonderful exhibition of electrical appliances now being held at Philadelphia has so strongly directed popular attention to the subject of electricity, that the following compilation of statistics may be interesting:

600 B. C.—Thales, an early Greek philosopher, and one of the seven wise men, states that "amber, when rubbed, attracts light and dry bodies," and this seems to have been the earliest and only acquaintance of the ancients with electricity. Lucretius, however, and others before him, had discussed magnetism—now regarded as an electrical phenomenon.

1600 A. D.—The inventor of the word *electricity*, Gilbert, of Colchester, gave a list of substances possessing same property as amber; electricity, derived from the Greek word electron, meaning amber.

1672 A. D.—The first electric machine ever made, "a globe of sulphur, turned by a handle and rubbed by a cloth pressed against it by the hand." Invented by Otto Von Guericke.

1709 A. D.—A machine constructed by Hawksbee, noted for his improvements of the inventions of Papin, etc.—substituting a glass cylinder for the sulphur ball of Von Guericke. This was the first use of glass in electrical machines

1729 A D.—Electricity first transmitted from one place to another by Grey and Wheeler, who claimed to distinguish conducting and non-conducting bodies.

1733 to 1745—The identity of electrics and non-conductors, and of non-electrics and the two kinds of electricity, as well as the fundamental principle regarding their action were shown by Dufay. Up to this date the glass rubbed by cloth was used in all experiments.

1476—Mushenbrœk, at Leyden, claims to have discovered (by accident) the Leyden jar; which honor, however, is contested in favor of a burgess of the same town named Cunens; also in favor of one, Kleist, canon of the Cathedral of Camin, in Pomerania.

1747—Franklin explained the electric conditions of the Leyden jar.

1752—Franklin proved the identity of lightning and electricity by his famous kite experiment.

1760—Franklin made the first lightning conductor.

1768—The first plate machine was constructed by Ramsden.

1775—The electrophorus, invented by Volta.

1780—Nairn made a two-fluid cylinder machine.

1782—Volta invented the condenser.

1786—Galvani made the discovery which led to the addition of the new branch of the science which bears his name.

1787—Coulomb, with his torsion balance, investigated the laws of attraction and propulsion.

1800—Carlisle and Nicholson decomposed water by the use of Volta's pile. They were the first to use platinum electrodes.

1801—Wollaston attributed galvanic electricity to chemical action, and demonstrated the identity of galvanic and frictional electricity.

1802—Cruikshank improved the construction of the pile by disposing the plates horizontally in a trough instead of vertically in a column.

1807—Davy obtained for the first time by galvanic agency the metals potassium, sodium, barium, strontium, calcium and magnesium.

1813—Davy discovered the electric light and voltaic arc.

1820—Œrsted first observed the action of the current on the magnetic needle.

1820—The use of a galvanometer, lines of wire and a battery as a means of telegraphing.

1820—Ampere discovered the law of the action of the current on the magnetic needle, and originated an original theory of magnets.

1820—Schweigger invented the galvanometer.

1825—Becquerel investigated the conductibility of metals.

1826—Kemp made the first use of amalgamated zinc for the galvanic battery.

1832—Dr. Joseph Henry first established the fact that mechanical effects could be produced by galvanic current at a distance, operating upon a magnet or needle, and that the telegraph was therefore possible.

1833—About a mile of wire was suspended in this year by Gauss and Weber at Gottingen to aid in their investigations. Their alphabet was composed of right and left reflections.

1837—Electric telegraphing gave the greatest promise of becoming practically important. Cooke and Wheatstone secured patents on semaphore or signal apparatus. This same year Steinhill, of Munich, stretched telegraph wires over the houses for a distance of three miles, and telegraphed by deflections of the needle by sounding of bells and by printing.

Professor Morse in same year exhibited his automatic recording telegraph, 1½ miles in extent.

1840—Cooke & Wheatstone patented the first step-by-step telegraph.

1846—Bains' electro-chemical telegraph was patented.

1851—The first submarine telegraph was laid between Dover and Calais.

1854—Faraday first announced the effects of lateral induction.

1858—First Atlantic cable laid, but failed after four hundred messages had been transmitted.

1865—The telegraph was completed by way of the Persian Gulf to India.

1865—A second cable was attempted, but after 1,200 miles were deposited it was lost.

1866—Another cable successfully laid The lost cable was found and continued to the western shore.

The Gerard Incandescent Lamps and Dynamo.

Messrs. Gerard & Co., of London, recently exhibited at the International Health Exhibition held there, a new form of dynamo and incandescent lamp, concerning which we have received some inquiries. We gave a brief description at the time, but are now, through the courtesy of *Engineering*, able to give it complete with illustrations.

The direct current machine, which is represented by Fig. 1, is formed of a hollow cast-iron cylinder, very exactly bored in the interior, within which there are fixed four electro-magnets arranged in the form of a cross. The polar extensions of these magnets enclose a cylindrical cavity within which the armature is situated. The framing of the machine carries upon each of its faces a cross-piece, upon which is mounted a bearing for the steel shaft that carries the armature. This latter is in the shape of a cross, and has its branches wound with insulated wire, until the whole assumes approximately a cylindrical form. The magnets are arranged in series or in parallel, or they may be wound in the so called compound manner, but in any case the opposite poles are of like name.

The branches of the armature are of sheet metal; they are magnetized in the contrary sense to the field magnets, under whose influence they are for the time being, and are alternately north and south, each north pole having a south pole at either side of it. The wire is wound in series and lies in planes parallel to the shaft; the ends are soldered to a commutator which consists of a cylinder divided into four segments, of which each opposite pair are connected together. Two brushes placed at right angles press against the commutator and collect the current. In the series machines the current all passes round the field magnets. In the shunt machines a fraction of the current only, depending upon the external resistance, circulates in the field magnet coils. By the rotation of the armature the polarity of its branches is reversed each quarter revolution, and this gives rise to a continuous current which is increased by the direct induction in the convolutions of wire passing before the field magnets.

M. Gerard has also designed an alternate current machine, of which the general appearance bears a resemblance to the Siemens machine. In this the field magnets are formed of two series of oblong bobbins mounted upon a double framing, in the center of which is the armature. This machine can feed twenty-four arc lamps, or 144 lamps of 50 candle-power, or 240 lamps of 25 candle-power. The Gerard arc lamps and many other details of the system have already been described in these columns, and passing over these we shall confine ourselves on this occasion to his newly invented incandescent lamps.

The Gerard incandescent lamp has already met with success both in domestic and ornamental lighting. Unlike the arc lamp, in which no further economy seems possible to be effected, the incandescent lamp is far from having attained perfection, and it is to be expected that, as improvements succeed each other, its life will grow gradually longer, and its cost will be diminished. There are no reliable figures as to the duration of the Gerard lamp, but from its construction it would appear that, as regards cost, it may compare favorably with its rivals, when it comes to be manufactured on a large scale. In this lamp there is no filament of carbonized vegetable. The incandescent part is composed of rods of carbon manufactured like the pencils of arc lamps. These rods, the diameter of which varies according to the type of the lamp, but is always very small, are arranged in the shape of an inverted **V**. The ends are connected by means of a carbonaceous cement, which resists perfectly the heating effect of the current. The branches of the **V** are fixed by means of the same cement into two small cylinders of carbon mounted on the platinum wires. These wires, embedded in a rod of enamel, pass through the neck of the exhausted globe which forms the lamp, and are soldered to two collars of copper which are fixed by screwing upon the neck of the lamp. The whole is mounted in a simple holder formed of two elastic copper clips.

The simplest forms of lamp are shown in Figs. 2 and 3, and upon this model M. Gerard has constructed various modified forms, which differ in the diameter and length of the carbons, in the method of their arrangement, and in the size of the globe.

ARC LAMP—FIG. 4.

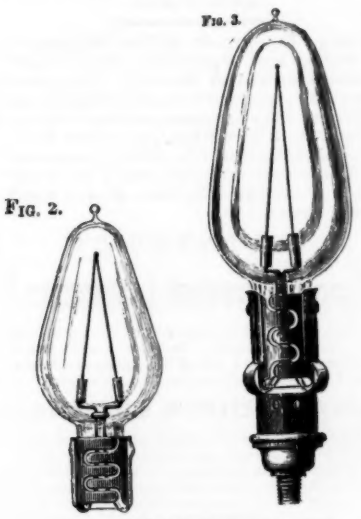


FIG. 2.

FIG. 3.

GERARD INCANDESCENT LAMP.

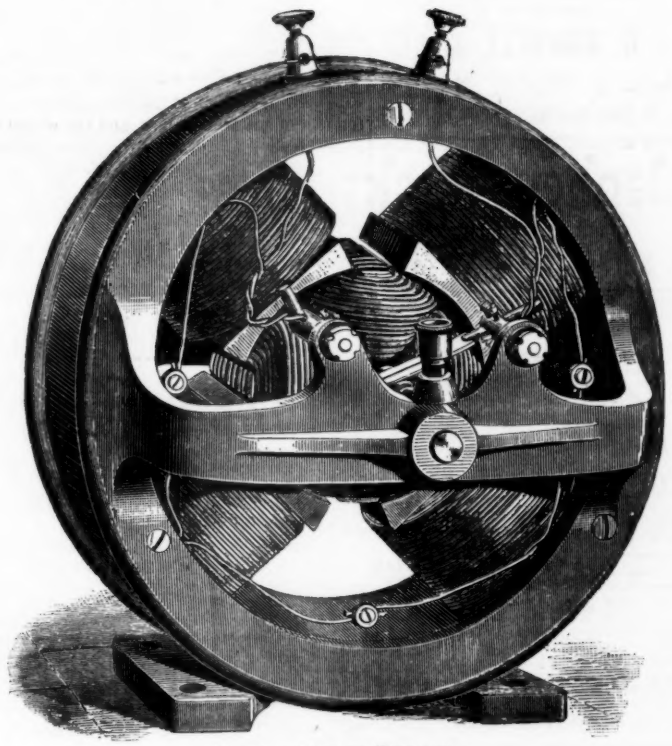


FIG. 1.—GERARD DYNAMO.

An Impossibility Asked.

"The city asks an impossibility," said the manager of the Bankers and Merchantts' Telegraph Co., in Philadelphia, in discussing the question of underground wires. "We could bury our trunk line, but that would not sensibly diminish the number of overhead wires, for it would remove only one line of poles. The fact is that no satisfactory underground system has yet been devised, and, while telegraph companies are anxious enough to bury their wires, the immediate enforcement of this ordinance would result in great inconvenience to the public."

An officer of the American District Telegraph Company declared that his company would gladly be rid of overhead wires if it could.

NO SATISFACTORY SYSTEM DEVISED.

"The Bru-h Electric Light Company will gladly put its wires underground the moment a feasible plan for doing so is suggested," said Superintendent M. D. Law, of that company, "but there is absolutely nothing satisfactory as yet. We went to great expense in laying underground cables on Delaware Avenue, but the wires have not worked for weeks, and we are now taking them up from Vine Street to Pier 12. The thing is a total failure. Even were a practicable plan suggested, the work of burying the wires would result in blocking Chestnut Street for weeks. Nobody is more anxious for this result than we, and I think it will eventually come about, but not now."

A. J. Beauchamp, secretary and general manager of the Brush Company, said: "What is the use of discussing this matter? People will simply refuse to believe us, saying that we are interested parties. But the city asks an impossibility. Shall we eventually have underground wires? Well, we hope for all good things, and some of the most thoughtful of inventive minds are engaged on this problem.

"We may reasonably hope for a successful solution, but one of the ablest electricians of the country has just failed in this matter after months of close study. Nobody but some man with a system of his own invention pretends that wire can now be put under ground. I don't think the city will be so unreasonable as to enforce this ordinance."

"What would result should the city persist in this matter?" was asked.

"We'd simply stop business," was the answer.

The working, by electromotive tramcars or electro-locomotives, of the tramway along the Rue de la Loi, Brussels, which should, according to contract made between the Tramway Company and La Societe Belge et Hollandaise d'Electricite, have been commenced on 1st July, has been postponed on account of successive improvements introduced into the electrical portion of the vehicles.

ELECTRIC LIGHT NEWS

—— The contract for lighting the new steel cruiser Atlanta has been awarded to the United States Electric Lighting Company of New York, and that for lighting the steel cruiser Boston to the Brush Electric Company of Cleveland.

—— If accounts which come to us are to be trusted, the New Orleans Exposition is to show the finest exhibit of electric lighting, both arc and incandescent, yet seen. It promises to be one of the most interesting features of the exhibition.

—— As a result of the recent experiments with the electric light for aiding the search for dead and wounded on the battle field, the Geneva Conference has decided to recommend European Governments to adopt this light in future as part of the ambulance plant.

—— The editor of the *Centralblat für Electrotecknik* informs his readers that he has got a keyless watch, made by a Nuremberg watchmaker, which is uninfluenced by the electric current. It has gone well for a whole year, although placed near one of the poles of a powerful electro-magnet. We should be glad of details of this useful watch, the possession of one such being better than any of the alternatives supposed to be the only resource with a magnetized watch, viz., subjecting it to alternate currents of decreasing intensity, raising it to a red heat, or throwing it on the scrap heap.

—— The electric light formed a prominent feature in the city illuminations on the occasion of the visit of the Prince and Princess of Wales to Newcastle-on-Tyne on August 20 and 21. Three powerful arc lights, each of 8,000 candle-power, were erected in different parts of the city; one of these was placed in the beautiful lantern tower of St. Nicholas' Cathedral, and was visible for many miles around. The light shining through the stone tracery threw dark shadows across the sky in the shape of a gigantic cross. The other two lights were placed in the principal streets, one of them being just opposite to the gas offices, where an extensive gas illumination was exhibited.

—— The electric light plant in the new Post Office in Philadelphia is the largest single or isolated plant in the United States. All the workings of the system are carried on in the building, and not from a distant station, as is generally the case. Throughout the structure there are 100 large arc lamps and 600 incandescent globes. The system is that owned by the Maxim Company. Because of the experiment in using a separate plant on so large a scale, and for other reasons, the Government did not pay at once the cost of the plant to the company putting it in. On Thursday last, however, owing to an examination made by the Chief Clerk of the Treasury Department, the balance on the contract, $20,000, was ordered paid.

The following account of the electric light at Turin is translated from an article which appeared in one of the leading Italian newspapers:

"It is impossible to keep our eyes shut any longer to the brilliant and numerous applications of electricity for illumination. The electric light, as a source of illumination, is undoubtedly destined to supersede gas. The incomparable superiority of this system of illumination over all others that are known to us up to the present time is just now beginning to be appreciated by us, and, whilst remembering that it may be still further perfected by study and careful research, the experiment at Turin makes us now entirely in favor of lighting the establishments and streets of the town by this new method of illumination. At the instigation of G. Doll, Esq., director of the Establishment Gruber, the large square of Turin is lighted magnificently by the electric light, to the general satisfaction and pleasure of the inhabitants

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 16, 1884.

305,045 Electrical circuit closer; Thos. W. Bryant, Ansonia, Conn.

305,046 Carbon battery; Thomas W. Bryant, Ansonia, Conn.

305,096 Electric arc lamp; Norman McCarty, Brooklyn, N. Y., assignor to the Electrical Supply Company, Ansonia, Conn.

305,147 Electric railroad; Theophilus P. Chandler, jr., Philadelphia, Pa.

305,164 Electrical cigar lighter; Richard N. Dyer, New York, N. Y.

305,175 Electric arc lamp; Edgar Grauert, New York, N. Y.

305,177 Engraving machine; George M. Guerrant, New York, N. Y.

305,178 Engraving machine; George M. Guerrant, New York, N. Y., and John C. Guerrant, Danville, Va., assignors to said George M. Guerrant.

305,191 Incandescent electric lamp; William Holzer, Harrison, N. J., assignor by mesne assignments to the Edison Lamp Company, same place.

305,192 Solution for refining copper and separating gold, etc., from copper; Jas. S. Howard, Springfield, Mass, assignor to J. M. Abbott, Waterbury, Conn.

305,194 Mechanism for the electrical transportation of goods, etc.; Fleeming Jenkin, Edinburgh, Scotland.

305,200 Reflector for incandescent lamps: Philip H. Klein, jr., New York, N. Y., assignor to Bergmann & Co., same place.

305,259 Autographic telegraph; M. Hoffman Wilson, Brooklyn, assignor of three-twentieths to Henry McCobb, New York, N. Y.

305,262 Telegraphic transmitter for unskilled operators; Theodore Ames, Hackensack, N. J.

305,310 Electric circuit closer; John H. Holmes, Newcastle-upon-Tyne, county of Northumberland, England.

305,321 Electric brush; Mary McMullin, 127 Strand, county of Middlesex, England.

305,359 Electric railway signal; William Vogel, Chicago, Ill., assignor to the Locomotive Telephone and Electric Railway Signal Company, same place.

305,413 Electric lamp mechanism; Elihu Thomson, New Britain, Conn., assignor to the Thomson-Houston Electric Company, of Connecticut.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40.00. Various other Foreign patents may also be obtained.

Any of our readers having copies of the old REVIEW of the TELEGRAPH AND TELEPHONE, dated March 15th, 1882 (No. 3), not specially needed by them, will confer a great favor upon us by sending them to this office, for which we will remit twenty-five cents per copy. DELANO & COMPANY,
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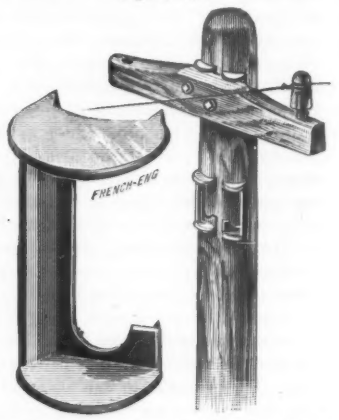

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